

Original article

## The Etiology of Dry Eye Syndrome in a Group of Patients visited Ophthalmic Department of Azady Teaching Hospital in Kirkuk

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### Abstract:

- **Background:** Dry eye disease (DED) is a multifactorial, chronic inflammatory condition of the tears and ocular surface that affects quality of life, causing ocular discomfort and vision abnormalities. It is under-recognized, with challenges in diagnosis and treatment. This study aims to clarify the etiology of dry eye syndrome, assess the distribution of age and gender among patients, and identify associated risk factors.
- **Methods:** A descriptive study was conducted on 946 patients (504 females, 442 males), aged 40 years and above, attending Azady Teaching Hospital's ophthalmology department from July 2020 to September 2021. Participants completed a structured questionnaire, and dry eye symptoms were diagnosed based on clinical signs, slit-lamp examination, Schirmer's test, and tear break-up time (TBUT).
- **Result:** Of 946 patients, 168 (17.8%) were diagnosed with dry eye disease. The mean age of the dry eye group was 57.2 years. The prevalence was higher in females (19.4%) compared to males (15.8%), and was more common in postmenopausal women. Ocular diseases such as blepharitis and meibomian gland dysfunction, systemic conditions like rheumatoid arthritis and diabetes, and drug use (antihypertensives, antiglaucoma medications) were significant risk factors.
- **Conclusions:** Dry eye is common in older adults, particularly females, and is associated with various ocular and systemic factors. Early diagnosis and targeted management are crucial for improving quality of life.
- **Keywords:** Dry eye, elderly, postmenopausal



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## INTRODUCTION

Dry eye disease (DED) is a multifactorial, chronic inflammatory condition of the tears and ocular surface, leading to discomfort and vision abnormalities (1). It is an under-recognized clinical disorder whose etiology and treatment present ongoing challenges for clinicians and researchers (2). DED is characterized by an unstable tear film, which contributes to inflammation and damage to the ocular surface, causing symptoms like burning, irritation, and dryness. This condition has a substantial detrimental impact on a patient's quality of life, interfering with daily activities such as reading, computer use, and driving (3). Chronic irritation can lead to inflammatory damage to both the cornea and conjunctiva (4).

The primary causes of dry eye can be categorized into two types: a reduction in aqueous tear production, often resulting from gland dysfunction, and increased evaporative loss. Evaporative dry eye is typically linked to meibomian gland dysfunction (MGD), which is a disorder of the glands responsible for producing the lipid layer of the tear film. Additionally, extended reading or prolonged use of digital devices such as laptops and mobile phones can exacerbate tear evaporation, contributing to the development of dry eye (5).

A growing area of research in dry eye studies focuses on its impact on visual function and quality. The reduction in blink rates that occurs during visual tasks, such as reading or using electronic devices, can aggravate the signs and symptoms of dry eye, ultimately impairing a patient's visual function and quality of life (6, 7).

This study aims to clarify the etiology of dry eye syndrome, investigate the distribution of age and gender among the study group, and identify the risk factors contributing to dry eye.

## **PATIENT and METHOD**

This study was conducted at Azady Teaching Hospital in Kirkuk, Iraq, specifically in the ophthalmology department. A total of 946 patients, aged 40 years and above, participated in the study. Among them, 504 were female and 442 were male. All participants gave their consent to be part of the study. The study period ranged from July 1, 2020, to September 1, 2021, and was carried out on an outpatient basis.

The study design was descriptive, and data was gathered through structured interviews with the patients, along with a review of their medical records. Ethical approval for the study was obtained from the Research Committee of the Iraqi Ministry of Health, and written informed consent was acquired from all participants.

Inclusion criteria for the study included patients aged 40 years and above, attending the ophthalmology department with any ocular signs, and those who were newly diagnosed or had a history of dry eye disease. Exclusion criteria included patients younger than 40 years, those with active keratitis or conjunctivitis, foreign bodies, extensive ocular surface diseases, recent ocular surgeries, or those presenting for a follow-up visit.

Data collection involved a detailed structured questionnaire that included questions regarding patient demographics (age, gender, occupation, lifestyle), primary ocular complaints (e.g., burning, itching, grittiness, dry eye feeling), duration of the symptoms, and medical history (including systemic conditions such as diabetes, hypertension, and autoimmune diseases). Drug history, smoking habits, and ocular history, including contact lens use, were also recorded.

Dry eye symptoms were identified through self-reported questionnaires and confirmed by clinical examination. Slit-lamp examination was performed at 16x magnification to assess tear film abnormalities, including tear meniscus height, regularity, and debris. Tear film break-up time (TBUT) was measured using fluorescein dye, and patients with TBUT less

than 10 seconds were diagnosed with dry eye. The Schirmer test was also conducted to measure tear production. A result of less than 10 mm of wetting after 5 minutes indicated dry eye. Further assessments included evaluations for conjunctival hyperemia, blepharitis, meibomian gland dysfunction (MGD), and corneal abnormalities such as punctate erosions, filaments, and mucus plaques.

Statistical analysis was performed using SPSS version 20.0. The significance level was set at  $P < 0.05$ . Data were presented as means  $\pm$  standard deviation (SD), and the Chi-square test and t-test were used to compare patient groups.

## RESULTS

Out of the 946 patients enrolled in this study, 168 (17.8%) were diagnosed with dry eye syndrome. The mean age of the study group was 55.5 years, while the mean age of the dry eye group was 57.2 years. The prevalence of dry eye in the study population was 17.8%, with the highest prevalence observed in the elderly. The majority of dry eye cases (42%) were found in patients aged 60-69 years, as shown in Table 1.

**Table 1: Age distribution among the dry eye group**

<b>Age group</b>	<b>Frequency</b>	<b>percent</b>
<b>40-49</b>	38	22%
<b>50-59</b>	44	26%
<b>60-69</b>	70	42%
<b>70-79</b>	16	10%
<b>Total</b>	168	

The study group consisted of 504 females and 442 males. Dry eye syndrome was found to be more common in females, with 98 cases (19.4%) compared to 70 cases (15.8%) in males, with a statistically significant difference ( $p = 0.016$ ). Most of the female patients in this study

were postmenopausal (64%), with only 36% being premenopausal ( $p = 0.039$ ). Smoking had no significant effect on the prevalence of dry eye ( $p = 0.23$ ). Regarding lifestyle factors, no significant effect was observed between those working outdoors or indoors, with a p-value of 0.153 (Table 2).

**Table 2: Sociodemographic distribution of dry eye**

Variables		Frequency	Total	Percent	P value
<b>Sex</b>	Male	70	442	15.8%	0.016
	Female	98	504	19.4%	0.016
<b>Occupation</b>	Indoor	112	624	18%	0.153
	Outdoor	56	322	17.4%	0.153
<b>Hormonal</b>	Premenopausal	34	98	34.7%	0.039
	Postmenopausal	64	98	65.3%	0.039
<b>Smoking</b>	Dry eye group	14	168	8.3%	0.23
	Study group	67	778	8.6%	0.23

The most common etiological factors for dry eye in this study were ocular, systemic, and drug-induced causes. Ocular conditions such as blepharitis and meibomian gland dysfunction (MGD) were found in 20% of cases, while abnormalities of the ocular surface (e.g., pterygium and pinguecula) were observed in 12%. Systemic diseases contributing to dry eye included rheumatoid arthritis (12%), diabetes (10.7%), and thyroid disease (4.8%). Drug-induced dry eye was mainly caused by antihypertensives (15.4%) and antiglaucoma medications (8.3%) (Table 3).

**Table 3: Dry eye causes**

Category	Causes	Frequency	Percent
<b>Ocular causes</b>	Diseases of the eyelid	32	19%
	Ocular surface abnormalities	20	12%
	Old trachoma	8	4.8%
	Ocular surgery	6	3.6%
	Trauma	4	2.4%
<b>Systemic disease</b>	Rheumatoid Arthritis	20	12%
	Diabetic	18	10.7%
	Thyroid disease	8	4.8%
	Sjogren	4	2.4%
	Pemphigus	2	1.2%
<b>Drug induced</b>	Antihypertensive	26	15.5
	Antiglaucoma	14	8.3%
	Antihistamine	4	2.4%
	Anticholinergic	2	1.2%
<b>Total</b>		168	100%

Regarding symptoms, the most frequent ones reported by dry eye patients included irritation (88%), itching (84.5%), foreign body sensation (65.4%), and blurring of vision (54.7%) (Table 4). Less common symptoms included crust on the eye upon waking (32%), pain on blinking (25%), and photophobia (20%) (Table 5).

**Table 4: Most frequent symptoms of dry eye patients**

Symptom	Frequency	Percent
<b>Irritation</b>	148	88%
<b>Itching</b>	142	84.5%
<b>foreign body sensation</b>	110	65.4%
<b>Blurring of vision</b>	92	54.7%
<b>Burning sensation</b>	64	38%
<b>Red eye</b>	60	35.7%

**Table 5: Less frequent symptoms of dry eye patients**

<b>Symptom</b>	<b>Frequency</b>	<b>%</b>
<b>Crust on eye on waking</b>	54	32%
<b>Pain on blinking</b>	42	25%
<b>Photophobia</b>	34	20.2%
<b>Lack of emotional tear</b>	30	17.9%

The most common signs of dry eye observed were a thin tear meniscus (77.4%), irregular tear film (72%), and loss of tear film concavity (69%) (Table 6). Less common signs included punctate epithelial erosion (PEE) (29.8%), corneal filament (10.7%), and mucus plaque (6%) (Table 7).

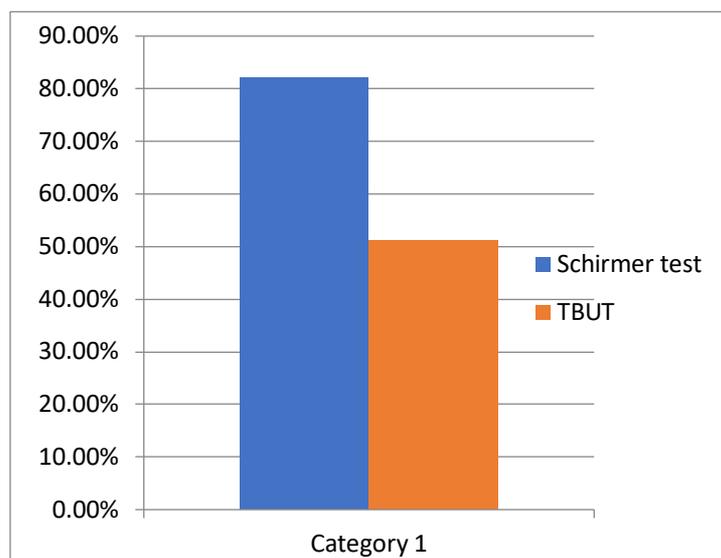
**Table 6: Most common signs of dry eye patients**

<b>Sign</b>	<b>Frequency</b>	<b>Percent</b>
<b>Thin tear meniscus</b>	130	77.4%
<b>Irregular tear film</b>	121	72%
<b>Loss of concavity of tear film</b>	116	69%
<b>Debris in tear film</b>	86	51.2%
<b>Foamy tear</b>	80	47.6%

**Table 7: Less common signs of dry eye patients**

<b>Sign</b>	<b>Frequency</b>	<b>Percent</b>
<b>PEE</b>	50	29.8%
<b>Corneal filament</b>	18	10.7%
<b>Mucus plaque</b>	10	6%

Regarding dry eye testing, the Schirmer test showed less than 10 mm of wetting in 138 cases, and 86 cases had a tear break-up time (TBUT) of less than 10 seconds (Figure 1).



**Figure 1: Sensitivity of dry eye tests among dry eye patients**

## DISCUSSION

In our study of 946 patients, 168 (17.8%) were diagnosed with dry eye disease, which is consistent with the prevalence rates observed globally. For instance, Johnny L Gayton's study reported a dry eye prevalence ranging from 7% in the United States to 33% in Taiwan and Japan (8). A meta-analysis of global prevalence found that dry eye disease rates range from 5% to 50% (1), with European estimates ranging between 7% and 22% (9). This wide variation in prevalence can be attributed to differences in dry eye syndrome definitions and the diverse populations studied (10).

The mean age of our study group was  $55.5 \pm 8.4$  years, while the mean age of the dry eye group was 57.2 years, with a significant difference between the two groups ( $p = 0.043$ ). The

highest prevalence of dry eye (42%) was found among patients in their sixties, which is consistent with findings from other population-based studies (11). Furthermore, multiple studies have supported the view of an age association with dry eye, with significantly drier eyes in individuals older than 40 years (12,13).

Regarding gender distribution, dry eye syndrome was more prevalent in females (19.4%) compared to males (15.8%), with a statistically significant difference ( $p = 0.016$ ). This result is in line with findings by Farrand et al. (14), who reported that women are almost twice as likely to report severe dry eye symptoms as men. In our study, the majority of females with dry eye were postmenopausal (64%), aligning with findings from studies by Schaumberg et al. (15) and Versura et al. (16), which linked hormonal changes in postmenopausal women to a higher incidence of dry eye.

In terms of lifestyle factors, no significant association was found between dry eye syndrome and working indoors or outdoors, as evidenced by a p-value of 0.153 (Table 2). This contrasts with some other studies, which showed a decrease in subjective symptoms of dry eye in office workers due to lifestyle interventions (17). Similarly, smoking had no significant impact on dry eye prevalence in our study, which is consistent with a meta-analysis that found no statistically significant relationship between smoking and dry eye (18).

The most frequently reported symptoms in our dry eye group were irritation (88%), itching (84.5%), and foreign body sensation (65.4%), with blurring of vision (54.7%) and burning sensation (38%) also common. These symptoms are consistent with those reported by Craig JP et al. (19), who found similar discomfort symptoms such as burning, stinging, and foreign body sensation.

The main etiological factors contributing to dry eye in our study included ocular, systemic, and drug-induced causes. The most common ocular causes were eyelid diseases, including blepharitis and meibomian gland dysfunction (MGD) (20%), followed by ocular surface

abnormalities like pterygium and pinguecula (12%). Systemic causes such as rheumatoid arthritis (12%) and diabetes (10.7%) were also prevalent. These findings align with studies by McCulley and Shine (20) and Junhua Li (21). Additionally, antihypertensive drugs (15.4%) and antiglaucoma medications (8.3%) were the most commonly identified drug-induced causes of dry eye, which is consistent with other research showing a wide range of drug categories associated with dry eye (23-25).

In terms of clinical signs, the most common findings in dry eye patients were a thin tear meniscus (77.4%), irregular tear film (72%), and loss of concavity in the tear film (69%). These findings were in line with those from other studies, where abnormalities such as hyperemia in the eyelid margins and conjunctival abnormalities like nasal staining and conjunctivochalasis were frequently noted (26,27).

Regarding diagnostic tests, 80% of dry eye patients showed a Schirmer test result of less than 10 mm after 5 minutes, and 51% had a tear break-up time (TBUT) of less than 10 seconds. These results suggest that most cases of dry eye in our study were primarily due to tear deficiency, consistent with the findings of Korb et al. (28). In our study, the Schirmer test was the most frequently used diagnostic tool, followed by TBUT.

## **CONCLUSION**

Individuals aged above 40 years are at a higher risk of developing dry eye disease, which should be considered when examining patients in the ophthalmic department. Additionally, females, particularly those who are postmenopausal, are more susceptible to dry eye, and this should be taken into account when examining female patients at outpatient clinics. Dry eye is a prevalent condition, and accurate diagnosis is crucial for effective treatment. To avoid overlooking the disease, it is important to be aware of patients at higher risk, such as those with ocular diseases like pterygium, pinguecula, trauma, previous ocular surgery, or old

trachoma. Systemic conditions such as rheumatoid arthritis, diabetes, and thyroid disease, along with long-term use of drugs like antiglaucoma medications, antihypertensives, antihistamines, and anticholinergics, should also be considered as risk factors for dry eye.

## **RECOMMENDATIONS**

We recommend that future studies focus on further investigating the prevalence, incidence, and risk factors associated with dry eye within the community to gather more comprehensive data.

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### **Ethical Clearance:**

The study was approved by the Research Committee of the Iraqi Ministry of Health. All participants provided their informed consent to participate and were clinically examined for dry eye symptoms.

### **Financial support and sponsorship:**

Nil.

### **Conflicts of interest:**

There are no conflicts of interest.

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