Prevalence of Symptomatic Dry Eye and its Risk Factors in Central Region, Saudi Arabia: A Cross-Sectional Study

Abdulrahman J Alharbi[1]*, Amal B Alharbi[2], Ayshah S Alajmah[3], Aisha A Alghamdi[3] and Ahmed Al-Muhaileb[4]

[1]Optometry Department, Alrass General Hospital, Qassim Health Cluster, Ministry of Health, Saudi Arabia

[2]College of Medicine, Qassim University, Saudi Arabia

[3]Optometry Department, Eye Specialist Center, King Abdulaziz Specialist Hospital, Ministry of Health, Saudi Arabia

[4]Department of Surgery, Unaizah College of Medicine and Medical Sciences, Qassim University, Saudi Arabia

*Corresponding Author: Abdulrahman J Alharbi, Optometry Department, Alrass General Hospital, Qassim Health Cluster, Ministry of Health, Saudi Arabia.

Abstract

Background: Different regions indicates different prevalence levels of the dry eye syndrome. Some risk factors are common across all the regions in the world while some are specific to certain regions. Estimating the prevalence levels and determining the risk factor helps in estimating the weight of the issue by the health care providers as well as the government policies to address the health issue.

Purpose: This study aims to evaluate the prevalence and identify possible risk factors for DES in the central region of Saudi Arabia.

Methods: Methods was conducted a prospective descriptive cross-sectional study between May and July 2018. This sample consisted of 604 Saudi including 104 control group. The participants were selected by the criteria of staying in Saudi Arabia for more than 3 years while those from the control group had lived in region for less than six months. All participants answered an electronic self-administered questionnaire which asked about the consent at the beginning, some sociodemographic details, symptoms and risk factors related to DES. To assess ocular symptoms, the Ocular Surface Disease Index (OSDI) score was used. Data were presented as frequency, mean, median, and standard deviation. A t-test was used to compare between different age groups. Multivariate regression was used to identify possible predictors of DES.

Results: The prevalence level was 59.1% which is statistically high. Most affected were the old and the university students. Female students were affected than male students. The risk factors are hot climatic conditions experienced with the region, old age, refractive surgery and use of contact lenses.

Conclusion: Symptomatic DES is highly prevalent among central region population. Main predictors of DES were age, hot weather, use of contact lens and refractive surgery. The recommendation is that the concern of increasing rate of use of contact lenses among students without following health guidelines should be addressed.

Keywords: Dry Eye Disease; Dry Eye Syndrome (DES); OSDI; Dry Eye; Central Region; KSA

Introduction

Dry eye syndrome (DES) is a condition of the tears and ocular surface that is caused by a multiplicity of factors and presents as eye discomfort, ocular disturbance, and instability of the tear film. It occurs due to excessive tear evaporation or reduced tear production and may eventually lead to ocular surface damage [1,2]. Even though it rarely causes vision loss, symptomatic DES inevitably reduces the quality of life [3-5].

Symptomatic DES is one of the most common ocular diseases and a major reason for visits to ophthalmologic clinics [6,7]. Symptoms range from mild temporary irritation to severe persistent dryness, itchiness, burning sensation, pain, visual disturbance, and ocular fatigue [3,8].

Several environmental and epidemiological risk factors of dry eye have been identified in the literature. These risk factors include female gender [13,17,19,20], advanced age [13,17,21], arthritis, gout, thyroid disease, diabetes, caffeine use, cigarette smoking [13,22], contact lens wear [23] and pterygium [3] among others.

Questionnaire based surveys are used to estimate the prevalence levels of the dry eye disease. In addition to the questionnaires, tests are conducted to help collect data. Examples of tests used in these studies are Schemer's test, fluorescein staining, tear break up time, and rose Bengal staining [16,17].

The central region includes Riyadh city (capital city of Saudi Arabia) and Qassim province (about 400 km from Riyadh) and their cities, towns, and villages. In the central region, like most of the Saudi regions, the hot desert climate could be a potential risk factor for dry eye [21]. The region includes the areas of Qassim and Riyadh whose population is about 8 million. The hot climate implies that there is high rate of evaporation and windy days. Other studies on central Saudi Arabia have indicated high levels of use of contact lenses among women for cosmetic purposes [27]. Most of the users do not strictly follow guidelines provided by the eye care professionals on use of the contact lenses. The levels of use are high among university students. About 43% of the users share the lenses among their friends despite knowing the use guidelines provided [27].

This study therefore seeks to identify the prevalence levels of dry eye syndrome in the region of central Saudi Arabia as well as the risk factors associated with it.

Methods

Study population and design

The study adopted descriptive cross-sectional study approach and was carried out between May and July 2018. The aim of the study was to evaluate the prevalence and identify possible risk factors for DES in the central region of Saudi Arabia. The study included male and female Saudi participants aged between 10 and 65 who live in the central region of Saudi Arabia and had lived in Saudi for more than 3 years. The control participants were people who did not think they were suffering from the eye problem and had lived in Saudi for less than six months. 604 participants which included 500 respondents and 104 members of the control group. Control group was identified through referral method.

Data collection

An electronic questionnaire was conducted electronically, which is an Ocular Surface Disease Index (OSDI) used to assess dry eye symptoms on a scale from 0 to100, where 100 represents the highest score and severe impacts. The questionnaire included the consent, questions about demographic profile, vision and ocular symptoms and risk factors related to dry eye disorder. The OSDI score included

three questions related to ocular symptoms, 6 questions about vision-related function and 3 questions about the environmental triggers. Each question has scores ranging from 0 to 4 where 0 represent (none of the time), and 4 represent (all the time). The final score was calculated using the following formula:

$$OSDI = \frac{(sum\ of\ scores) \quad 25}{number\ of\ questions\ answered}$$

The questionnaire was tested on a random sample of participants (n = 52) after it was translated into Arabic by a competent bilingual translator to confirm appropriateness, reliability, and clarity of the terms and questions.

Statistical analysis

Data analysis was performed using the Statistical Package of Social Sciences (SPSS) Version 21 (SPSS Inc., Chicago, IL). Qualitative and quantitative variables were measured frequencies, mean, median, standard deviation and others. The t-test was performed to compare between different age groups. The level of significance was set at $p < 0.05$.

Results

A total of 604 participants (261 males, 343 females) participated in this study, giving a response rate of 96%. The prevalence of symptomatic dry eye was 59.01%. The average age (± SD) of the study participants was 25.57 (± 8.09) years.

The frequency of risk factors was 264 (43.7% for contact lens usage, 161 (26.7%) for refractive surgery, 69 (11.4%) for smoking, 31 (5.1%) for hypercholesterolemia, 27 (4.5%) for arthritis, 15 (2.5%) for antidepressant medication, 15 (2.5%) for thyroid disease, 11 (1.8%) for aspirin use, 10 (1.7%) for diabetes (See table 1).

Sociodemographic variables	n (%)
Age	
Mean ± SD (years): 25.57 ± 8.09	
Minimum (years): 12	604 (100)
Maximum (years): 63	
Gender	
Male	261 (43.2)
Female	343 (56.8)
Risk factors	
Smoking	69 (11.4)
Arthritis	27 (4.5)
Diabetes	10 (1.7)
Thyroid disease	15 (2.5)
Hypercholesterolemia	31 (5.1)
Aspirin use	11 (1.8)
Antidepressant	15 (2.5)
Contact lenses use	264 (43.8)
Refractive surgery	161 (26.7)

Table 1: Demographic characteristics and risk factors, distribution of study population (n = 604).

Normal participants were 247 (40.9%) where the males and females were 122 (49.4%), 125 (50.6%) respectively. For mild symptomatic dry eye represented 120 (19.9%), male was 57 (47.5%). The female was 63 (52.5%). For moderate symptomatic dry eye represented as 65 (10.8%), were 27 (41.5%) male, 38 (58.5%) female. Finally, participants with severe symptomatic dry eye represented as 172 (28.5), were 55 (32%) male, 117 (68%) female (Table 2).

Variable	Severity of dry eye				
	Normal	Mild	Moderate	Severe	Total
Gender					
Male n (%)	122 (46.7)	57 (21.8)	27 (10.3)	55 (21.1)	261 (100.0)
Female n (%)	125 (36.4)	63 (18.4)	38 (11.1)	117 (34.1)	343 (100.0)
Total n (%)	247 (40.9)	120 (19.0)	65 (10.8)	172 (28.5)	604 (100.0)

Table 2: The prevalence of mild, moderate, and severe dry eye distributed by gender (n = 604).

This study shows that the majority of the subjects suffer from severe symptomatic dry eye followed by mild symptomatic dry eye, where the female has greater numbers of asymptomatic dry eye. OSDI score was highly significant among genders (p = 0.00). The mean score for males was 20.55 (± 19.68) and for females was 26.62 (± 21.93).

357 (59.1%) participants were suffering from mild to severe dry eye. this indicates high levels of prevalence for the dry eye syndrome. Among the 357, were from the control group and suffered mild dry eye. This indicates that there was a likelihood of a correlation between the hot climate and the high prevalence of the dry eye among the people. The median age for the study was 42 indicating that the dry eye syndrome affected older people than young people.

The difference was highly significant in the OSDI score for cholesterol (p = 0.000). Participants with cholesterol had a higher score, mean score was 42.20 (± 25.42) compared to those with no cholesterol 23.01 (± 20.5). For instance, participants who used aspirin were also statistically significant (p<0.05), with a higher mean score of 41.1 (± 32.9) compared to participants with no aspirin usage having a mean score of 23.68 (± 20.82). Furthermore, arthritis disease participants had a higher mean score of 33.49 (± 25.43) compared to those without arthritis for the mean score of 23.55 (± 20.89). Similarly, contact lens usage showed a statistical significance with a higher mean score of 30.82 (± 23.15) compared to participants with no use of contact lens having a mean score of 21.86 (± 20.09). Finally, the gender of participants showed highly statistically significant (p < 0.05), given a higher mean score for females compared to male (Table 3).

Variable		N	Mean ± SD	p-value
Gender	Male	261	20.55 ± 19.68	0.000
	Female	343	26.62 ± 21.93	
Smoking	Yes	69	24.61 ± 25.44	0.259
	No	535	23.91 ± 20.6	
Arthritis	Yes	27	33.49 ± 25.43	0.017
	No	577	23.55 ± 20.89	
Diabetes mellitus	Yes	10	34.58 ± 21.74	0.111
	No	594	23.81 ± 21.15	
Thyroid diseases	Yes	15	33.75 ± 26.51	0.071
	No	589	23.74 ± 21.0	
Cholesterol	Yes	31	42.20 ± 25.42	0.000
	No	573	23.01 ± 20.5	
Aspirin	Yes	11	41.1 ± 32.9	0.007
	No	593	23.68 ± 20.82	
Antidepressant	Yes	15	30.97 ± 19.51	0.197
	No	589	23.82 ± 21.21	
Contact lens	Yes	264	30.82 ± 23.15	0.000
	No	340	21.86 ± 20.09	
Refractive surgery	Yes	161	25.57 ± 17.22	0.523
	No	433	23.80 ± 21.63	

Table 3: Student's t-test for comparison between participants who have certain factor and those who do not have (n = 604).

Logistic regression analysis is done to demonstrate the association between different factors and presence of dry eye symptoms and that shows the main predictors of DES were high cholesterol level (OR = 3.88; 95% CI: 1.26 - 11.98), use of contact lens (OR = 1.61; 95%CI: 1.01 - 2.53), and refractive surgery (OR = 1.96; 95%CI: 1.07 - 3.56) (Table 4).

Variables	P-value	OR	95% CI	
			Lower	Upper
Gender (male)*	0.68	0.92	0.62	1.36
Smoking (yes)	0.23	0.71	0.41	1.25
Arthritis (yes)	0.15	2.13	0.76	5.97
Diabetes (yes)	0.43	1.92	0.38	9.73
Thyroid diseases (yes)	0.23	2.27	0.99	8.62
Cholesterol (yes)	0.01	3.88	1.26	11.98
Aspirin (yes)	0.99	1.07	0.31	3.63
Antidepressant (yes)	0.90	1.42	0.94	2.12
Contact lens (yes)	0.04	1.61	1.01	2.53
Refractive surgery (yes)	0.03	1.96	1.07	3.56
Constant	0.35	1.20		

Table 4: Logistic regression analysis to demonstrate association.
OR: Odds Ratio; CI: Confidence Interval.
* Reference category is female for the gender variable and 'no' response for.

Discussion

The results indicate a number of things. In the central region of Saudi Arabia, the level of prevalence for the dry eye syndrome is high. Equally more women than men were affected by the eye problem. Most affected of the participant were the old people more than the young people. However, the results indicated reliable high number of infections among the university going youths [27]. There was fewer rate of infection among people who had lived in Saudi Arabia for less than one year compared to those who had lived longer there. This indicates that the harsh climate exposes many citizens of the province to high risks of the dry eye syndromes [27]. Studies have shown a great correlation between hot and windy climate and dry eye syndrome. The rate of evaporation is high leading to the itchy and irritating feeling on the eye. Old people are more disposed to suffering from the dry eye because of the aging of the body system and slowing in their metabolic functions [4,9]. The high level of infection among the university students was due to increased use of contact lens and sharing of the lenses with the friends at campus [27]. These statistics indicates that the dry eye was more prevalent among the female students than the male students. This is because the rate of use of the lenses was high among the girls than the men. Ladies were predisposed to beauty and cosmetic products than men thus the difference in the levels of infection for both genders.

From the results, the key significant risks factors are the use of contact lenses and refractive surgery. While other variables have indicated some form of correlation, it was hard to establish the correlation between even the normal people were suffering from ailment like arthritis, diabetes and smoking. The statistics showed that there was balance between those who were normal and those who suffered from the dry eye. However, people who suffered from dry eye had at one point used contact lens or undergone a refractive surgery. This was uncommon for those who were considered to be normal in this study [6,13,26]. This therefore indicates that besides the old age and harsh weather environment, use of contact lens and refractive surgery exposed many to suffering from dry eye syndrome. Participants who had undergone a refractive eye surgery were also exposed to high risks of suffering from the dry eye syndrome. This is because the surgery exposed them to other risk factors of the dry eye like hot weather.

Conclusion

There is high prevalence (59.1%) for dry eye syndrome in the central region of Saudi Arabia. The main risk factor is age, hot climatic conditions, use of contact lenses and refractive surgery. The major concern indicated by the study is the increasing rate of the dry eye syndrome among the university students due to increased use and sharing of contact lenses for beauty purposes with low adherence to the guideline provided by eye care professional.

Further studies should explore the factors fueling this behavior as well as estimating its impact on the prevalence of the dry eye syndrome among the people in the region.

Bibliography

1. Brewitt H and Sistani F. "Dry eye disease: the scale of the problem". *Survey of Ophthalmology* 45.2 (2001): S199-202.

2. The definition and classification of dry eye disease: report of the Definition and Classification Subcommittee of the International Dry Eye Work Shop". *The Ocular Surface* 5.2 (2007): 75-92.

3. Lee AJ., *et al.* "Prevalence and risk factors associated with dry eye symptoms: a population based study in Indonesia". *British Journal of Ophthalmology* 86.12 (2002): 1347-1351.

4. Tong L., *et al.* "Impact of symptomatic dry eye on vision-related daily activities: the Singapore Malay Eye Study". *Eye* 24.9 (2010): 1486-1491.

5. Pouyeh B., *et al.* "Impact of ocular surface symptoms on quality of life in a United States veterans affairs population". *American Journal of Ophthalmology* 153.6 (2012): 1061-1066.

6. Alshamrani AA., *et al.* "Prevalence and Risk Factors of Dry Eye Symptoms in a Saudi Arabian Population". *Middle East African Journal of Ophthalmology* 24.2 (2017): 67-73.

7. Bandeen-Roche K., *et al.* "Self-reported assessment of dry eye in a population-based setting". *Investigative Ophthalmology and Visual Science* 38.12 (1997): 2469-2475.

8. Begley CG., *et al.* "Characterization of ocular surface symptoms from optometric practices in North America". *Cornea* 20.6 (2001): 610-618.

9. Lemp M. "Epidemiology and classification of dry eyes". In: Sullivan DA, et al, ed Lacrimal gland, tear film and dry eye syndromes 2. New York: Plenum Press (1998): 791-803.

10. Clegg JP., *et al.* "The annual cost of dry eye syndrome in France, Germany, Italy, Spain, Sweden and the United Kingdom among patients managed by ophthalmologists". *Ophthalmic Epidemiology* 13.4 (2006): 263-274.

11. Albietz JM. "Prevalence of dry eye subtypes in clinical optometry practice". *Optometry and Vision Science* 77.7 (2000): 357-363.

12. Schiffman RM., *et al.* "Reliability and validity of the Ocular Surface Disease Index". *Archives of Ophthalmology* 118.5 (2000): 615-621.

13. Moss SE., *et al.* "Prevalence of and risk factors for dry eye syndrome". *Archives of Ophthalmology* 118.9 (2000): 1264-1268.

14. Lin P-Y., *et al.* "Prevalence of dry eye among an elderly Chinese population in Taiwan: the Shihpai Eye Study". *Ophthalmology* 110.6 (2003): 1096-1101.

15. Hashemi H., *et al*. "Prevalence of dry eye syndrome in an adult population". *Clinical and Experimental Ophthalmology* 42.3 (2014): 242-248.

16. Schein OD., *et al*. "Prevalence of dry eye among the elderly". *American Journal of Ophthalmology* 124.6 (1997): 723-728.

17. McCarty CA., *et al*. "The epidemiology of dry eye in Melbourne, Australia". *Ophthalmology* 105.6 (1998): 1114-1119.

18. Rege A., *et al*. "A Clinical Study of Subtype-based Prevalence of Dry Eye". *Journal of Clinical and Diagnostic Research* 7.10 (2013): 2207-2210.

19. Schaumberg DA., *et al*. "Hormone replacement therapy and dry eye syndrome". *The Journal of the American Medical Association* 286.17 (2001): 2114-2119.

20. Shimmura S., *et al*. "Results of a population-based questionnaire on the symptoms and lifestyles associated with dry eye". *Cornea* 18.4 (1999): 408-411.

21. Bukhari A., *et al*. "Prevalence of dry eye in the normal population in Jeddah, Saudi Arabia". *Orbit* 28.6 (2009): 392-397.

22. Jie Y., *et al*. "Prevalence of dry eye among adult Chinese in the Beijing Eye Study". *Eye* 23.3 (2009): 688-693.

23. Tan LL., *et al*. "Prevalence of and risk factors for symptomatic dry eye disease in Singapore". *Clinical and Experimental Optometry* 98.1 (2015): 45-53.

24. Wolkoff P., *et al*. "The modern office environment desiccates the eyes?" *Indoor Air Quality* 16.4 (2006): 258-265.

25. Wolkoff P., *et al*. "Eye complaints in the office environment: precorneal tear film integrity influenced by eye blinking efficiency". *Occupational and Environmental Medicine* 62.1 (2005): 4-12.

26. Galor A., *et al*. "Prevalence and risk factors of dry eye syndrome in a United States veterans affairs population". *American Journal of Ophthalmology* 152.3 (2011): 377-384.

27. Alhamyani A., *et al*. "Prevalence of dry eye symptoms and its risk factors among patients of King Abdulaziz Specialist Hospital (Taif), Saudi Arabia". *Saudi Journal for Health Sciences* 6.3 (2017): 140.

28. Titiyal JS., *et al*. "Prevalence and risk factors of dry eye disease in North India: Ocular surface disease index-based cross-sectional hospital study". *Indian Journal of Ophthalmology* 66.2 (2018): 207-211.

Volume 13 Issue 9 September 2022