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A STUDY ON THE ASSOCIATION OF DRY EYE WITH DYSLIPIDEMIA

Ophthalomology

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ABSTRACT

Aim: This study investigates the association of dry eye disease (DED) with dyslipidemia. The study also assessed the association of visual display terminal (VDT) and DED in patients with dyslipidemia. The meibomian gland dysfunction (MGD) in DED in patients with dyslipidemia was also studied. **Methods:** In the OPD, 60 patients aged 20-60 years with dyslipidemia were studied. After obtaining informed consent, medical history, and direct interviews using a questionnaire, emphasis was placed on dry eye history before applying the DEEP score. Assessments included VDT use, visual acuity, slit lamp examination for ocular allergy signs, and meibomian gland dysfunction degree. Diagnostic tests (Tear break up time (t-BUT), Fluorescein staining, Schirmer's test) determined dry eye grading. Patients were categorized by gender and dry eye status. Serum lipid levels were analyzed to establish the dyslipidemia-DED association. Dyslipidemia criteria included elevated cholesterol, triglycerides, low-density lipoprotein (LDL), and low high-density lipoprotein (HDL) levels. **Results And Findings:** In women, a significant association exists between DED and dyslipidemia ($p < 0.001$), with total cholesterol showing notable relevance, particularly in women. The correlation between dyslipidemia and DED is more prominent among women than men. There was a major difference between the VDT usage in patients with and without DED. Additionally, a substantial difference in MGD is evident between DED and non-DED patients ($p = 0.001$). **Conclusion:** Findings reveal a robust association between DED progression and dyslipidemia in women. Patient education on dry eye and ophthalmologists diagnosing dyslipidemia can prevent blindness and cardiovascular disease. t-BUT is affected significantly among VDT users shows that tear film becomes unstable by their usage, hence helps in finding the actual correlation of dry eye with the use of VDT. MGD demonstrates statistical significance ($p = 0.001$), leading to tear film alterations, eye irritation, inflammation, and ocular surface disease.

KEYWORDS

INTRODUCTION

- Dry disease is a disease of the ocular surface characterized by loss of homeostasis of the tear film, and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiological role.
- Hyperosmolarity of tears leads to epithelial and goblet cell death and damage to the lacrimal function. This presents as ocular inflammation and symptoms of DED. Tear film instability can lead to increased tear evaporation and in turn an addition to hyperosmolarity.
- In open eyes, the tears are spread into three compartments; tear menisci, forniceal and the tear film. They constitute preocular tears, in which precorneal film overlies the cornea and prebulbar covers the bulbar conjunctiva.
- Chemical analysis of lipids from normal meibomian glands shows that it consists of mixture of non-polar lipids and polar lipids. Dyslipidemia is one of the significant modifiable risk factors for cardiovascular diseases. Although, the importance of the lipid layer in tear composition is well accepted, there is little information about whether dyslipidemia resulting from systemic lipid disorder is related to DED.

AIM AND OBJECTIVE

To study the association of dry eye with dyslipidemia.

1. To study the association of dry eye disease with dyslipidemia.
2. To study the association of visual display terminal and dry eye disease in patients with dyslipidemia.
3. To assess the meibomian gland dysfunction in dry eye disease in patients with dyslipidemia.

METHODOLOGY

Study Design: Cross-sectional study

Sample Size:

3A study was carried out on 100 patients diagnosed with dry eye, both in the OPD and in the hospital wards. Patients aged between 20 and 60 years were considered for inclusion in the study. Those meeting all the eligibility criteria and none of the exclusion criteria were invited to take part.

Data and fasting blood samples for assessing serum lipid levels were collected from the dry eye patients. Schirmer's Test, fluorescein staining of cornea and tear-break up time (TBUT) Test were conducted. The ophthalmology department analyzed selected patients to investigate the link between dry eye and dyslipidemia by estimating serum lipid levels. Patients were also asked of the use of Visual Display Terminals and its association was found with dry eye.

Inclusion Criteria:

1. Patients in the age group of 20-60 years.
2. Patients who have complain of dry eye

Exclusion Criteria:

1. Patients with acute ocular infections.
2. Patient who has chronic dacryocystitis.

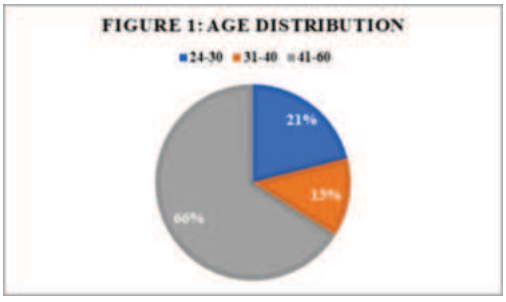
METHODOLOGY

- In the OPD the study was carried out to understand the association of dry eye in patients with dyslipidemia aged 20-60 years.
- The patients who attend the Ophthalmology OPD in the 20-60 age group were chosen and told about purpose of study. Each patient was explained about the importance of screening of dry eye disease and its effect on quality of life.
- Informed consent was taken from all the patients. A detailed medical history and direct interview with patients was taken using a questionnaire with emphasis on history pertaining to dry eye before administering the DEEP score.
- History of visual display terminal usage including television, smartphones, tablets, laptops was also analyzed.
- Visual acuity was estimated.
- Slit lamp examination was conducted for signs of ocular allergy and degree of meibomian gland dysfunction.
- Clinical examination like TBUT test, Fluorescein staining of cornea, Schirmer's test with 5 by 35 mm strip of Whatman-41 filter paper was performed to confirm diagnosis and grading of dry eye.
- After complete ocular examination patients were grouped as men without DED, men with DED, women without DED, women with DED.
- Blood samples were collected from all individuals. About 5ml of blood was withdrawn from overnight fasted individuals. Serum lipid levels of all individuals was analyzed in order to determine its association with DED. Dyslipidemia was defined as elevated cholesterol (TC: 150-200 mg/dl), Triglycerides (N: 60-150 mg/dl) and LDL (N: 80-150 mg/dl) and low levels of HDL (N: 35-65 mg/dl).

RESULT AND OBSERVATION

Table 1: Age Distribution		
Age	Frequency	Percentage (%)
24-30	21	21
31-40	13	13
41-60	66	66
Total	100	100%

Table 2: Gender Distribution		
Gender	Frequency	Percentage (%)
Male	50	50
Female	50	50
Total	100	100%



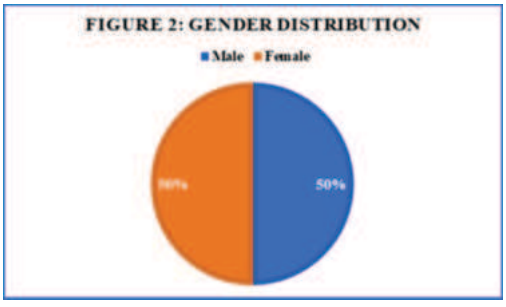


Table 3: TBUT Distribution		
TBUT	Frequency	Percentage (%)
Reduced	69	69
Normal	31	31
Total	100	100%

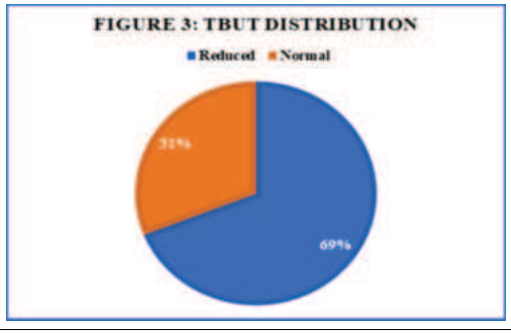


Table 4: Schirmer's Test Distribution		
Schirmer's Test	Frequency	Percentage (%)
Reduced	37	37
Normal	63	63
Total	100	100%

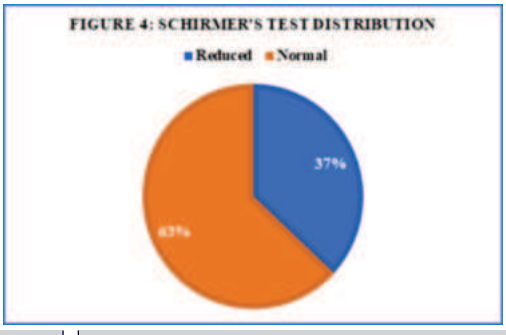
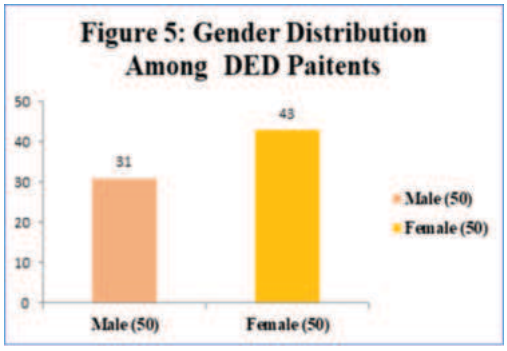


Table 5: Gender Distribution among DED Patients		
Gender	DED Count	Percentage (%)
Male	31	62
Female	43	86
Total (100)	74	74

Table 6: Prevalence of DED		
Age	DED Count	Percentage (%)
24-30	5	23.81
31-40	7	53.85
41-60	62	93.94
Total (100)	74	74



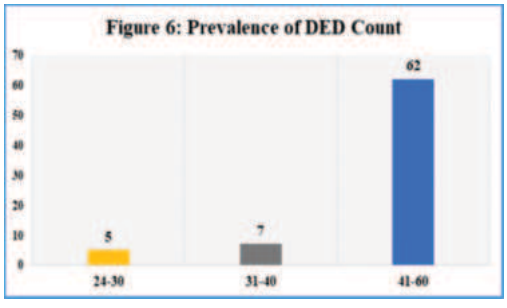


Table 7: No. Of Patients with abnormal score		
	Score 0	Score > 1
MES	64	36
MEQ	64	36

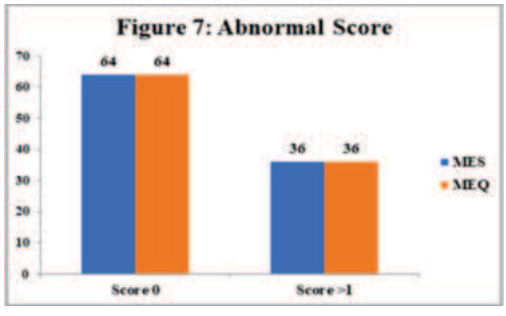


Table 8: MGD Distribution		
MGD	Frequency	Percentage (%)
Present	64	64
Absent	36	36
Total	100	100%

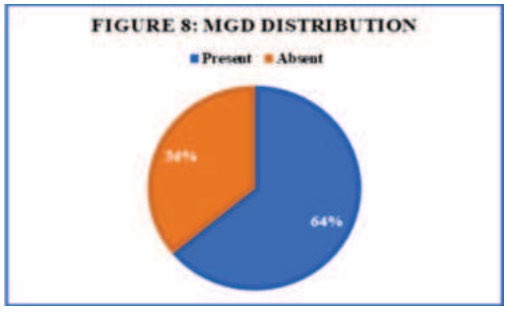


Table 9: Association MGD and DED					
MGD	DED Present (n=74)	DED Absent (n=26)	Total (n=100)	Chi-Square	P Value
MGD Present	51(68.92)	13 (50)	64 (64)	22.563	0.000002
MGD Absent	23 (31.08)	13 (50)	36 (36)	2.778	0.096

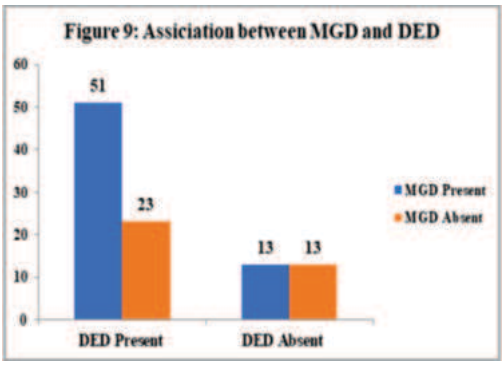
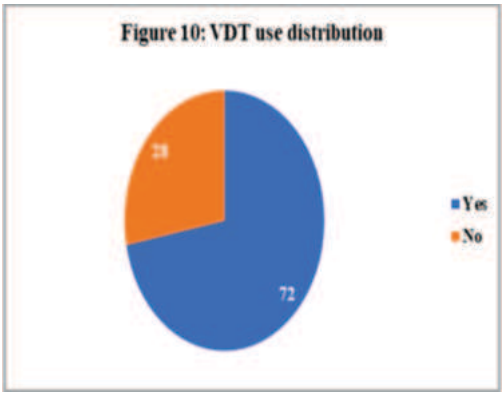


Table 10: VDT use Distribution		
VDT	Frequency	Percentage (%)
Yes	72	72
No	28	28
Total	100	100%



VDT use was found in 72 subjects. 55 out of these had DED. The difference between VDT use in with and without DED subjects was significant (P = 0.000008).

Table 11: Association between VDTs and DED					
VDT use	DED Present (n=74)	DED Absent (n=26)	Total (n=100)	Chi-Square	P Value
Yes	55 (74.32)	17 (65.38)	72 (72)	20.056	0.000008
No	19 (25.68)	9 (34.65)	25 (28)	3.571	0.059

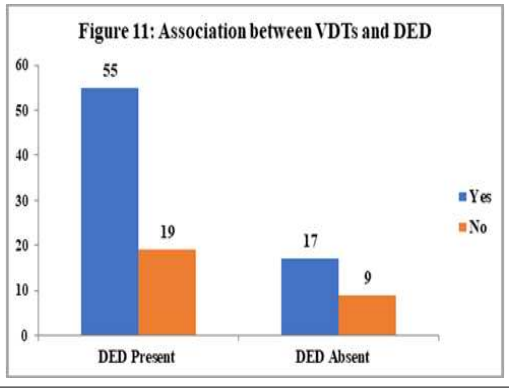
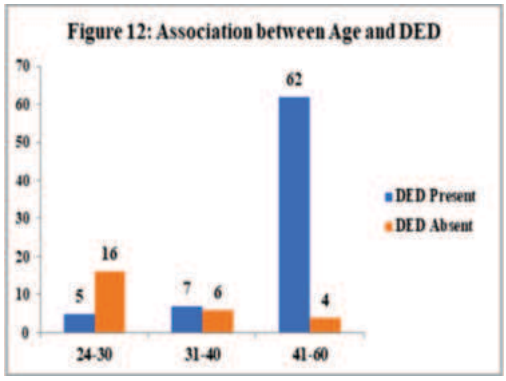
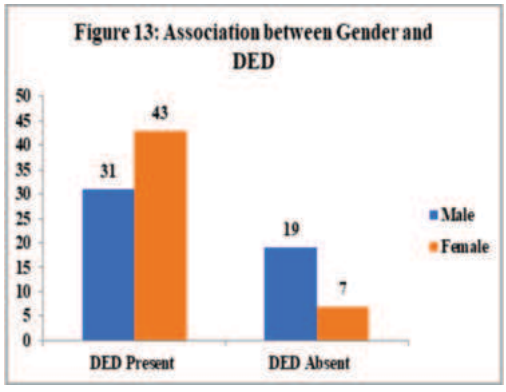


Table 12: Association between Age and DED					
Age	DED Present (n=74)	DED Absent (n=26)	Total (n=100)	Chi-Square	P Value
24-30	5(6.76)	16 (61.54)	21(21)	5.762	0.02
31-40	7(9.46)	6 (23.08)	13(13)	0.077	0.782
41-60	62 (83.79)	4(15.38)	66(66)	50.97	0.000000000001



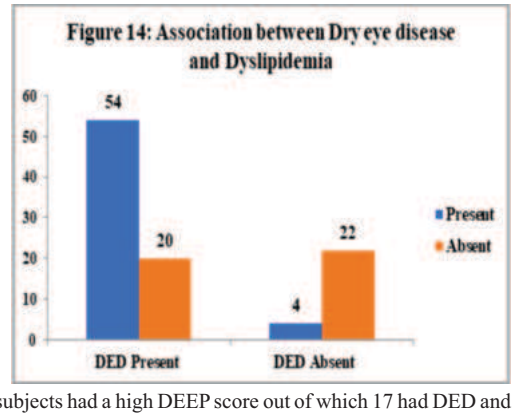
Out of the total 50 male patients, 31 subjects had DED and 19 did not have DED which depicts a P-value of 0.09. Out of the total 50 female patients, 43 subjects had DED and 7 did not have DED, which was statistically significant (P = 0.0000003).

Table 13: Association between Gender and DED					
Gender	DED Present (n=74)	DED Absent (n=26)	Total (n=100)	Chi-Square	P Value
Male	31(41.89)	19 (73.08)	50 (50)	2.88	0.09
Female	43(58.11)	7 (26.92)	50 (50)	25.92	0.0000003



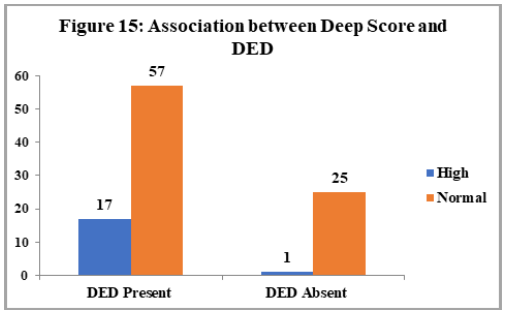
74 subjects had DED. Dyslipidemia was present in 54 of these subjects and depicted a P-value of 0.00000000006 which was highly significant.

Table 14: Association between Dry eye disease and Dyslipidemia					
Dyslipidemia	DED Present (n=74)	DED Absent (n=26)	Total (n=100)	Chi-Square	P Value
Present	54 (72.97)	4 (15.38)	58 (58)	43.103	0.00000000006
Absent	20 (27.03)	22 (84.62)	42 (42)	0.095	0.758



18 subjects had a high DEEP score out of which 17 had DED and 1 did not have DED (P = 0.0002). 82 subjects had a normal DEEP score, 57 had DED and 25 did not have DED (P = 0.0004).

Table 15: Association between DEEP Score and DED					
DEEP Score	DED Present (n=74)	DED Absent (n=26)	Total (n=100)	Chi-Square	P Value
High	17 (22.97)	1 (3.85)	18 (18)	14.222	0.0002
Normal	57 (77.03)	25 (96.15)	82 (82)	12.488	0.0004



DISCUSSION

- In the present study patients in the age set of 20-60 years were studied. Out of the total males and females, 31 (62%) and 43 (86%) had DED respectively. There was a statistical significance (P=0.0000003) in females as compared to males.
- TBUT was found to be reduced in 69% of the patients diagnosed to have dry eye disease showing significant relation of TBUT with DED.
- 37 out of 74 with DED had a positive Schirmer's test.
- 64% of the total subjects were found to have MGD. There was a substantial difference between MGD in patients with and without DED (P = 0.000002).
- VDT use was found in 72 subjects. 55 out of these had DED. There was a major difference between VDT use in patients with and without DED (P=0.000008).
- Out of the 74 patients having DED, 54 had dyslipidemia which was highly significant (P=0.00000000006).
- One plausible explanation is that abnormalities in serum lipids may trigger pathological alterations in the ocular surface, such as the corneal and conjunctival epithelia, lacrimal gland, and meibomian gland.
- The vital role of the meibomian glands in lipid secretion within the eyelids, systemic dyslipidemia can have implications for DED.
- Research has shown that maintaining a high-fat diet continuously for three months can lead to decreased tear secretion and diminished lipid accumulation, likely due to the activation of inflammation and oxidative stress on the ocular surface. Thus, blood serum lipid profiles need to be assessed in individuals having DED.
- Thus, the current study is an attempt to provide a holistic assessment of dry eye and its association with dyslipidemia which is important to control vision related problems.
- Krishnamoorthy Rathnakumar et al. discovered that out of 60 patients diagnosed with DED, 40 individuals, constituting 66.67% of both genders, exhibited MGD. Among these cases, a higher proportion (n=28) was observed among females, accounting for 46.7% of DED patients, in contrast to males, where the prevalence of MGD was noted to be 20%.
- Haakon et al. investigated the link between Dry Eye Disease (DED) and Visual Display Terminal (VDT) usage. Analyzing 57 relevant articles via PubMed, they found a prevalence of DED among VDT users and office workers ranging from 26% to 70%. Even as little as 1-2 hours of VDT exposure per day showed an association with DED.
- Hye Rin Choi et al describes the association between dyslipidemia and DES. In men with unadjusted odds ratio for DES was 1.29 (P=0.08) in people with dyslipidemia as compared to those without. On to other hand, for women, the unadjusted as well as fully adjusted odds ratio for DES in those with dyslipidemia was 1.05 and 1.10 respectively. Women had a higher prevalence of DED compared to men (55.4% vs. 38.9%, P<0.001).
- Yingsi Li et al. demonstrated a link between dyslipidemia and the risk of DED (OR=1.53, p=0.001).
- Bukhari et al found that of the dry eye subjects, 71.4% (167/234) had TBUT <= 10s. They also found that of the dry eye subjects, 24.8% (58/234) had a Schirmer's score <= 5 mm. According to Gupta N et al, there was statistical difference between Schirmer's test of study subjects and controls, p<0.005.

CONCLUSION

Utilizing a comprehensive and standardized questionnaire alongside standard dry eye assessments aids in the identification and management of dry eye. Additionally, factors such as gender, MGD, presence of VDT use, and associated systemic conditions like dyslipidemia should be considered during dry eye evaluation, given their positive correlation with the condition. Key aspects of managing dry eye patients involve educating them about the chronic nature of the disease process and providing comprehensive guidance on therapeutic regimens. MGD can lead to changes in the tear film, symptoms of eye irritation, clinically observable inflammation, and ocular surface disease. VDT users often experience a significant impact on TBUT indicating instability of the tear film due to VDT usage, which aids in establishing a direct correlation between dry eye and VDT use. Ophthalmologists should take on a more proactive role in educating themselves to recognize dyslipidemia and providing comprehensive eye care to prevent vision loss and cardiovascular complications. By focusing on prevention and addressing DED within the community, there is potential to enhance overall quality of life. Prevalence of DED increased as the age increased. Females showed higher preponderance to DED than males. The association of DED and dyslipidemia was found to be highly significant (P=0.00000000006). MGD was found to be statistically significant with P=0.000002. Similarly, Visual Display Terminal (VDT) use with P=0.000001 and the association of DEEP score with DED with P=0.0002 (high) and P=0.0004 (normal) were also statistically significant.

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