ISSN: 0975-3583,0976-2833 VOL14, ISSUE 08, 2023

A STUDY ON POSTERIOR BLEPHARITIS IN ASSOCIATION WITH DYSLIPIDEMIA

Dr S.Anuradha1, Dr. D. Johnson Rajkumar1, Dr. K. Vinamrutha2

1Assistant Professor, Department of Ophthalmology, Govt Regional Eye Hospital, Kurnool Medical College, Kurnool, AP, India
2Consultant, Lakshmi Eye Hospital, Yelhanka, Bangalore, Karnataka, India

Corresponding author: Dr. D. Johnson Rajkumar
Assistant Professor, Department of Ophthalmology, Govt Regional Eye Hospital, Kurnool Medical College, Kurnool, AP, India

ABSTRACT
Background: Blepharitis is chronic ocular inflammation that involves the eyelid margin primarily and is a common case of chronic ocular irritation. It is among the most common ocular condition effecting upto 47% of patients seen in the clinical settings. Anterior Blepharitis affects the eyelid skin, base of the eyelashes and the eyelash follicles and posterior blepharities affects the Meibomian glands, Meibomian gland dysfunction is one of most common cause of posterior blepharitis.
INTRODUCTION
Aim & Objectives: The main aim and objective of this study is to determine the association of serum lipid profile components in posterior blepharitis without meibomian gland dysfunction.
Methodology: The study titled "A study on posterior blepharitis in association with dyslipidemia" was carried out in the department of ophthalmology in a regional eye hospital, Kurnool medical college, Kurnool. A cross-sectional clinical study consisting of a total of 100 subjects with posterior blepharitis was undertaken. Fifty posterior blepharitis subjects with meibomian gland dysfunction and 50 without MGD were studied.
Results: This study showed the relation between dyslipidemia and Meibomian gland dysfunction. 100 subjects are having posterior Blepharitis screened for Meibomian gland dysfunction and sent for serum lipid profie. This study showed a significant difference between Meibomian gland dysfunction group and without meibomian gland dysfunction group to the various lipid parameters like serum Total Cholesterol (P>0.001), LDL Cholesterol (P>0.001) Serum Triglycerides (p=0.398) and LDL: HDL ratio (p=0.0044). The various stages Meibomian gland dysfunction also showed statistically significant difference in various lipid parameters. Higher stages of Meibomian gland dysfunction were associated with higher levels of serum cholesterol (p>0.001), LDL Cholesterol (p=0.004) Serum Triglycerides (0.085) and LDL: HDL ratio (p=0.0685).
Conclusion: This study shows an association between serum Lipid parameter and the prevalence of Meibomian glands dysfunction.

Keywords: Meibomian glands, HDL, LDL, Triglycerides, Blepharitis

INTRODUCTION

Blepharitis refers to a group of disorders characterized by eyelids' inflammation, including skin, eyelashes, and meibomian glands. Mostly it is bilateral and chronic with intermittent exacerbations. There are two types of blepharitis, anterior blepharitis, and posterior blepharitis. Both types of blepharitis symptoms include redness, foreign body sensation, burning sensation, itching, dry eye, crusting upon awakening, and blurred vision.

Anterior blepharitis is the inflammation of eyelid margins, skin, the base of eyelashes, and eyelash follicles and usually bacterial, like staphylococcal, seborrheic, or angular in origin. In contrast, the posterior eyelid inflammation is expressed as posterior blepharitis, caused primarily by the meibomian glands' dysfunction.

Meibomian gland dysfunction, which is the most common cause of posterior blepharitis, is a chronic abnormality of meibomian glands, characterized by terminal duct obstruction and glandular secretion changes. Meibomian gland dysfunction can lead to altered tear film composition, ocular surface disease, ocular and eyelid discomfort, and evaporative dry eye. As meibomian gland secretion is lipid in nature. It is only logical to search for the possible link between serum lipid level abnormalities and meibomian gland dysfunction.

Many studies have shown a strong positive association of high serum total cholesterol levels with meibomian gland dysfunction.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 08, 2023

Data regarding the correlation between serum lipoproteins and meibomian gland dysfunction has obtained from some studies. Dyslipidemia in itself is one of the known systemic risk factors for meibomian gland dysfunction. Studies show that the meibum of meibomian gland dysfunction patients has different components and proportions of cholesterol than normal subjects.

With the number of lifestyle changes involving dietary preferences, work habits, and the advent of computer usage in all spheres of life, the incidence, and prevalence of dry eye has increased dramatically in the general population. MGD may well b the leading cause of dry eye disease throughout the world but is often overlooked in busy outpatient settings.

AIMS AND OBJECTIVES

The aims and objectives of this study are

1. To describe the socio-demographic profile of study subjects.
2. To estimate the serum lipid profile of all subjects.
3. To determine the association of serum lipid profile components in posterior blepharitis with meibomian gland dysfunction.
4. To determine the association of serum lipid profile components in posterior blepharitis without meibomian gland dysfunction.

MATERIALS AND METHODS

The study titled "A study on posterior blepharitis in association with dyslipidemia" was carried out in the department of ophthalmology in a regional eye hospital, Kurnool medical college, Kurnool.

Study design:

A cross-sectional clinical study consisting of a total of 100 subjects with posterior blepharitis was undertaken. Fifty posterior blepharitis subjects with meibomian gland dysfunction and 50 without MGD were studied.

Source of data:

Subjects were attending ophthalmic OPD and IPD from regional eye hospital, Kurnool medical college, Kurnool.

Method of collection of data:

One hundred posterior blepharitis subjects,50 subjects with MGD served as the study group, and 50 subjects without MGD formed the control group.

The study subjects were then allocated into two groups.

- Posterior blepharitis with different stages of MGD consisting of 50 subjects
- Posterior blepharitis without MGD is composed of 50 subjects.

Study duration:

November 2019 to October 2021

Inclusion criteria:

- Patients of all ages are included in the study
- Patients diagnosed with posterior blepharitis with and without MGD based on signs and symptoms.

Exclusion criteria:

- Patients with infectious keratoconjunctivitis or inflammatory ocular surface disorder unrelated to meibomian gland dysfunction are excluded.
- Recent ocular surgeries.
- Alterations of the lacrimal drainage system.
- Concomitant topical medications, especially for glaucoma, are excluded
- Topical ophthalmic steroids are taken four weeks before the study.
- Pregnancy,sjogren’s syndrome,rosacea,parkinsons disease,cholestatic disease.
- Treatment with drugs affecting tearing like antihypertensive/cholinergic/ocp's etc.

Clinical evaluation:

The subjects were selected based on inclusion and exclusion criteria. Informed consent and patient demographic details, like name, age, and OP or IP numbers, were documented.

A detailed history was taken with the routine ocular examination. Baseline assessment includes:

- Symptoms scaled according to Ocular Surface Disease Index questionnaire(mild/moderate/severe)
- Measurement of blink rate and blink interval(average took 12–15/min)
- Measurement of lower tear meniscus height.(cut-off: 1.5 mm)

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 08, 2023

- Assessment of tear film breakup time(cut-off: 10 seconds)
- Grading of corneal and conjunctival fluorescein staining: Oxford and DEWS scale
- Schirmer's test(cut-off: 10 cm)
- The lacrimal drainage system was assessed (presence of DCR scar, soft/hard blocks, ectropion/entropion). Positive (abnormal) results in tests 1, 4, 5, and 6 provide partial evidence of a generic dry eye's presence without specifying whether it is aqueous-deficient or evaporative. Evidence of aqueous-deficient dry eye was obtained by measuring tear flow or assessing aqueous volume based on tear meniscus height or Schirmer test.

Mild-to-moderate conjunctival and peripheral corneal staining, often inferior (DEWS grade 8–23; Oxford grade 4–10).

Stage 4: Marked symptoms of ocular discomfort, itching, or photophobia with definite limitations of activities.
Severe MGD clinical signs

- Increased lid margin features: dropout, displacement
- Severely altered secretions: Grade ≥13
- Expressibility: 3.

Increased conjunctival and corneal staining, including central staining (DEWS grade 24–33; Oxford grade 11–15).
Laboratory Procedure: Serum lipid profile 5ml sample of fasting blood was collected under aseptic conditions from the anterior cubital vein using a disposable syringe to assess the lipid profile.
Various lipid components analyzed included:

1. Serum total cholesterol
2. Serum triglyceride(TG)
3. Serum low-density lipoproteins(LDL)
4. Serum high-density lipoproteins(HDL)
5. Serum very-low-density lipoproteins(VLDL)
6. Serum LDL: HDL

Statistical analysis

This involved the detection of hyperlipidemia in patients found to have MGD. Statistical evaluation was done by calculating the prevalence of dyslipidemia in patients with MGD as compared to age and sex-matched controls.

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean ± SD and median. Qualitative variables were correlated using Chi-square test/Fisher's exact test. Spearman's correlation coefficient was used to assess the correlation between age and stage. A *P* value of <0.05 was considered statistically significant. The data were entered in MS Excel spreadsheet and analysis was done using Statistical Package for the Social Sciences (SPSS) version 21.0

OBSERVATION AND RESULTS

The present study "A Study on posterior blephariris in **association** with Dyslipidemia" was conducted in Kurnool Medical College,Kurnool during the period of November 2019 to October 2021.
During this period, a total of 100 posterior blepharitis patients were anaylsed.50 subjects with meibomian gland dysfunction and 50 subjects without meibomian gland dysfunction were included in the study.

TABLE 1: CHARACTERISTICS OF STUDY POPULATION (MEAN) SERUM LIPID PROFILE

	WITH MEIBOMIAN GLANDDYSFUNCTION	WITHOUT MEIBOMIAN GLANDDYSFUNCTION
AGE (Years)	37.38	34.42
Total Cholesterol	204.16	175.4
TG	164.1	141.28
LDL	134.52	110.22
HDL	35.88	40.16
VLDL	30.98	27.34
LDL: HDL	3.43	3.206

TABLE 2: AGE GROUP DISTRIBUTION OF POSTERIOR BLEPHARITIS SUBJECTS

	N	MEAN	SD	Min	Max	P Value
With MGD	50	37.38	14.72	14	75	
Without MGD	50	34.42	12.61	14	70	0.42

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 08, 2023

Among 50 subjects with mgd, 19 subjects (38%) with Stage II meibomian gland dysfunction had serum cholesterol <200mg/dl and 9(18%) subjects with Stage III MGD had serum total cholesterol >200mg/dl. Comparison between different Stages of MGD showed statistically significant difference. Moreover, there is a moderate significant difference among various stages of meibomian gland dysfunction to serum total cholesterol levels.

Comparison between grades of MGD

Chi-square 13.005, P=0.004

Among 50 subjects with mgd, 19 subjects (40%) with Stage II meibomian gland dysfunction had serum LDL cholesterol <130mg/dl.10 (20%) subjects with Stage III MGD had serum cholesterol > 130 mg/dl.

Comparison between different Stages of MGD showed statistically significant difference between Stages 2 vs3. There is significance between various stages of meibomian gland dysfunction with serum LDL Cholesterol levels.

Table 3.AGE DISTRIBUTION OF TWO GROUPS OF SUBJECTS

	Age				Total
	<30	30-40	40-50	>50	
With MGD	17	14	13	6	50
	34%	28%	26%	12%	
Without MGD	20	17	9	4	50
	40%	34%	18%	8%	

Among Total 50 subjects with Meibomian gland dysfunction, 17 belong to > 30yrs category , 14 belng to 31-40 yrs category 13 belong to 41-50 yrs category and 6 belong to <50 yrs category.

Among 50 subjects without meibomian gland dysfunction, 20 belong to <30 yrs category, 17 belong to 31-40 yrs category, 9 belong to 41-50 yrs category, and 4 belong to > 50 yrs category. There is no significant difference between the age distribution of subjects with and without meibomian gland dysfunction.

Table 4. AGE DISTRIBUTION OF SUBJECTS WITH MGD

	Age				Total
	<30 Yrs	30-40 Yrs	40-50 Yrs	>50 Yrs	
Stage 1	4	3	1	0	8
	8%	6%	2%	0%	16%
Stage 2	12	7	3	2	24
	24%	14%	6%	4%	48%
Stage 3	1	2	7	3	13
	2%	4%	14%	6%	26%
Stage 4	0	2	2	1	5
	0%	4%	4%	2%	10%
Total	17	14	13	6	50
	34%	28%	26%	12%	100%

Among 50 subjects with MGD, 8 belong to stage 1, 24 belong to stage II, 13 belong to stage III, and 5 belong to stage IV.

Of the total 50 subjects with meibomian gland dysfunction 17 belong to <30 yrscategory, 14 belong to 31-40 yrs category, 13 belong to 41-5- yrs category, and 6 belong to >50 yrs category. There is no significance among the age distribution of subjects with melbomian gland dysfunction across all stages of severity.

Table 5. GENDER DISTRIBUTION OF THE STUDY SUBJECTS

Gender			Total
With MGD	Male	Female	
	23	27	50
	46%	54%	100%
Without MGD	22	28	50
	44%	56%	100%

Among 50 subjects with MGD, 23 (46%) were males and 27 (54%) females. Moreover, 50 subjects without MGD, 22 were males and 28 were females. There was no significant differences among the groups to the gender of the subjects

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 08, 2023

Table 6.GENDER DISTRIBUTION ACROSS ALL STAGES OF MSD

	Gender		Total
	Male	Female	
Stage 1	4	3	7
	8%	6%	14%
Stage 2	15	14	29
	30%	28%	58%
Stage 3	2	8	10
	4%	16%	20%
Stage 4	2	2	4
	4%	4%	8%
Total	23	27	50
	46%	54%	100%

The highest distribution among all stages was 29 subjects (15 males and 14 females) in stge II Meibomian gland dysfunction. The maximum was 15 subjects (30%) who were males in the stage II meibomian gland category. There is no significant difference across the stages of meibomiangland dysfunction among male and female subjects

Table 7. DISTRIBUTION OF RETINOPATHY WITH SERUM TOTAL CHOLESTEROL

	Serum Total Cholesterol (mg/dl)		Total
	<200	>200	
With MGD	32	18	50
	64%	36%	100%
Without MGD	41	9	50
	82%	18%	100%

Among 50 subjects without MGD 41 subjects (82%) had total serum cholesterol<200 mg/dl. Among 50 subjects with MGD, 18 subjects (36% had serum total cholesterol > 200 mg/dl . It shows a very significant.

Table 8. COMPARISION BETWEEN VARIOUS STAGES OF MEIBOMIAN GLAND DISFUNCTION WITH SERUM TOTAL CHOLESTEROL LEVELS

	Serum Total Cholesterol (mg/dl)		Total
	<200	>200	
Stage 1	6	2	8
	12%	4%	16%
Stage 2	19	5	24
	38%	10%	48%
Stage 3	4	9	13
	8%	18%	26%
Stage 4	3	2	5
	6%	4%	10%
Total	32	18	50
	64%	36%	100%

Among 50 subjects with MGD, 19subjects (38 %) with stage II meibomian gland dysfunction had serum cholesterol <200 mg/dl and 9 (18%) subjects with stahe III MGD had serum total cholesterol >200 mg/dl.

Comparison between different stages of MGD showed statistically significant difference. Moreover there is no a moderate significant differences among various stages of meibomian gland dysfunction to serum total cholesterol levels.

Table 9.DISTRIBUTION OF MGD WITH LDL CHOLESTEROL

	LDL CHOLESTEROL (Mg/dl)		Total
	<130	**>130**	
With MGD	31	19	50
	62%	38%	100%
Without MGD	35	15	50
	70%	30%	100%

Chi-squre 19.6, p<0.0001

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 08, 2023

Among 50 subjects without meibomian gland dysfunction, 35 subjects (70%) with serum LDL cholesterol levels <130 mg/dl and the rest 15 subjects (30%) have LDL cholesterol levels>130 mg/dl.
Among 50 subjects with meibomian gland dysfunction, 31 subjects (62%) had serum LDL CHOLESTEROL levels <130mg/dl and the rest 19 subjects (58%) have LDL cholesterol levels>130 mg/dl. This study shows a significant between the two groups of subjects to serum LDL cholesterol levels.

TABLE 10: DISTRIBUTION OF VARIOUS GRADE OF MGD WITH HDL CHOLOESTEROL

	) HDL (mg/dl)		
	<40	>40	Total
Stage 1	5	3	8
	10%	6%	16%
Stage 2	17	7	24
	34%	14%	48%
Stage 3	4	9	13
	8%	18%	26%
Stage 4	2	3	5
	4%	6%	10%
Total	28	22	50
	56%	44%	100%

Chi-square 6. 15, P=0.0104
Comparison between different stages of MGD showed no statistically significant difference.
It shows moderate significant difference among various stages of MGD with HDL cholesterol levels.

TABLE 11:DISTRIBUTION OF MGD WITH VLDL CHOLESTEROL

	VLDL (mg/dl)		
	<30	>30	Total
With MGD	25	25	50
	50%	50%	100%
Without MGD	35	15	50
	70%	30%	100%

Chi-square 1.461, P=0.226
Among 50 subjects without meibomian gland dysfunction, 35 subjects (70%) have serums VLDL cholesterol levels<30mg/dl and 15 subjects (30%) have VLDL cholesterol levels >30mg/dl.
Among 50 subjects with meibomian gland dysfunction, 25 subjects(50%) have serum VLDL cholesterol levels <30mg/dl and 25 subjects (50%) have VLDL >30mg/dl.

Table 12.DISTRIBUTION OF VARIOUS STAGES OF MGD WITH SERUM LDL CHOLESTEROL LEVELS

	LDL CHOLESTEROL (mg/dl)		**Total**
	<130	**>130**	
Stage 1	5	3	8
	10%	6%	16%
Stage 2	20	4	24
	40%	8%	48%
Stage 3	3	10	13
	6%	20%	26%
Stage 4	3	2	5
	6%	4%	10%
Total	31	19	50
	62%	38%	100%

Comparison of between grades of MGD
Chi-squre 13.005, p<0.004
Among the 50 subjects with MGD. 20 subjects (40%) with stage II meibomian gland dysfunction had serum LDL cholesterol <130 mg/dl. 10 subjects (20%) with stage III MGD had serum cholesterol >130 mg/dl.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 08, 2023

Comparison between different stages of MGD showed a statistically significant difference between stages 2 vs 3. There is significance between various stages of meibomian gland dysfunction with serum LDL cholesterol levels.

Table 13.DISTRIBUTION OF MGD WITH HDL CHOLESTEROL

	HDL(mg/dl)		Total
	<40	>40	
With MGD	28	22	50
	56%	44%	100%
Without MGD	44	6	50
	88%	12%	100%

Among 50 subjects without meibomian gland dysfunction, 44 subjects (88%) had serum HDL cholesterol levels <40 mg/dl and 6 subjects (12%) with HDL cholesterol levels>40mg/dl. Among 50 subjects with meibomian gland dysfunction 28 subjects (56%) had serum HDL cholesterol levels <40 mg/dl and 22 subjects (44%) had HDL cholesterol>40mg/dl. There is a significant association between two groups.

TABLE 14: DISTRIBUTION OF VARIOUS STAGES OF MGD TO VLDL CHOLESTEROL LEVELS

	VLDL (mg/dl)		Total
	<30	>30	
Stage 1	6	2	8
	12%	4%	16%
Stage 2	10	14	24
	20%	28%	48%
Stage 3	6	7	13
	12%	14%	26%
Stage 4	3	2	5
	6%	4%	10%
Total	25	25	50
	50%	50%	100%

Chi-square 2.943, P=0.400

This shows no significant difference between the groups of subjects and a significant difference between the various stages of MGD with VLDL cholesterol levels.

TABLE 15: DISTRIBUTION OF MGD WITH SERUM TRIGLYCERIDE

	TGL(mg/dl)		Total
	<150	>150	
With MGD	31	19	50
	62%	38%	100%
Without MGD	35	15	50
	70%	30%	100%

Chi-square 0.713, P=0.0398

Among 50 subjects without MGD, 35 subjects (70%) have TG levels<1500mg/dl and 15 subjects (30%) had serum TG levels >150mg/dl. Among 50 subjects with MGD, 31 subjects (62%) have serum TG cholesterol levels <150mg/dl and 19 subjects (38%) hadserum TG levels>150mg/dl. There is a moderately significant difference between two groups of subjects to serum triglyceride levels.

TABLE 16: DISTRIBUTION OF VARIOUS STAGES OF MGD WITH SERUM TRIGLYCERIDE LEVEL

	TGL (mg/dl)		Total
	<150	>150	
Stage 1	6	2	8
	12%	4%	16%
Stage 2	19	5	24
	38%	10%	48%
Stage 3	5	8	13
	10%	16%	26%
	3	2	5

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 08, 2023

Stage 4	6%	4%	10%
	32	18	50
Total	64%	36%	100%

Among 50 subjects with meibomian gland dysfunction, the serum TG levels were >150mg/dl in 19 subjects (38%). Comparison between different stages of meibomian gland dysfunction showed a statistically significant difference between grades 2&3. This study shows a moderately significant difference between various stages of meibomian gland dysfunction to rerum triglycerides.

TABLE 17: DISTRIBUTION OF MGD WITH SERUM LDL: HDL RATIOS

	TGL(mg/dl)		
	<2.5	>2.5	**Total**
With MGD	8	42	50
	16%	84%	100%
Without MGD	11	39	50
	22%	78%	100%

Chi-square 0.713, P=0.0398

Among 50 subjects without meibomian gland dysfunction, 11 subjects (22%) have LDL: HDL cholesterol levels<2.5 and 39 subjects (78%) had LDL: HDL cholesterol levels >2.5.

Among 50 subjects with meibomian gland dysfunction, 8 subjects (16%) had serum LDL: HDL cholesterol levels <2.5 and 42 subjects (82%) had LDL: HDL cholesterol levels >2.5 It shows a significant difference between the two groups

TABLE 18: DISTRIBUTION OF VARIOUS STAGES OF MGD WITH SERUM LDL: HDL RATIOS.

	LDL: HDL		
	<2.5	**>2.5**	**Total**
Stage 1	2	6	8
	4%	12%	16%
Stage 2	5	19	24
	10%	38%	48%
Stage 3	1	12	13
	2%	24%	26%
Stage 4	0	3	5
	0%	6%	10%
Total	8	42	50
	16%	84%	100%

Chi-square 1.486, P=0.0685

Comparison between different stages of meibomian gland dysfunction showed a statistically significant between Stages 1&3, 2&3. It shows a significant difference in various stages of meibomian gland dysfunction with serum LDL: HDL

TABLE 19: DISTRIBUTION OF MGD WITH BLINK RATE

	Grade 1 (12-15)	**Grade 2 (9-11)**	**Grade 3 (6-8)**	**Grade 4 (<5)**	**Total**
With MGD	20	15	11	4	50
	40%	30%	22%	8%	100%
Without MGD	32	10	7	1	50
	64%	20%	14%	2%	100%

Among 50 subjects with Meibomian gland dysfunction, 40% had normal blink rate, 30% had Grade II, 22% had Grade III, 8% had Grade IV blink rate.

TABLE 20: BLINK RATE INTERPRETATION

	TGL(mg/dl)		
	Normal	Abnormal	**Total**
	20	30	50

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 08, 2023

With MGD			
	40%	60%	100%
Without MGD	32	18	50
	64%	36%	100%
	40%	60%	100%
Without MGD	32	18	50
	64%	36%	100%

TABLE 21: DISTRIBUTION OF MGD WITH TEAR FILM BREAK TIME

	TBUT				
	>10 sec	6-10 sec	2-5 sec	<2 sec	**T**otal
With MGD	30	18	11	1	50
	60%	36%	22%	2%	100%
Without MGD	44	5	1	0	50
	88%	10%	2%	0%	100%

Of 50 patients with mgd, 30 persons had normal TBUT (>10 secs), 18 had 6-10 secs, 11 had 2-5 secs, only one person showed <2 secs of TBUT.

TABLE 22: DISTRIBUTION OF MGD WITH SCHIRMER'S SCORE

Schirmer's Score	**With MGD**	**Without MGD**
(Normal) >10 mm	31	42
	62%	84%
6-10 mm	15	8
	30%	16%
2-5 mm	4	0
	8%	0%
<2 mm	0	0
	0%	0%
2-5 mm	4	0
	8%	0%
<2 mm	0	0
	0%	0%

Of subjects with MGD, 31 patients had normal Schirmer's score (> 10 %), 15 had 6-10 mm, 4 patients had 2-5 mm score.

TABLE 23: DISTRIBUTION OF MGD WITH TEAR FILM MENISCAL HEIGHT

TFMH(mm)	**With MGD**	**Without MGD**
<0.3	19	4
	38%	8%
>0.3	31	46
	62%	92%
Total	50	50
	100%	100%

Among patients with meibomian gland dysfunction, 31 patients showed >0.3 mm height of TFMH which is normal, and 19 patients showed <0.3 mm of TFMH.

DISCUSSION

MGD is a highly complex disease condition that is associated with or caused by several host, microbial, hormonal, metabolic and environmental factors.MGD can cause chronic ocular irriation and is seldom reported accurately.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 08, 2023

Some studies postulate an MGD prevalence of up to 70%.[1,2] In clinical practice, however, mild asymptomatic cases may not be diagnosed. The cause of MGD is incompletely understood, but changes in meibum composition and/or obstruction of the meibomian glands is thought to be central to the process.[3,4]

Studies show that meibum of MGD patients has different components and proportions of cholesterol compared to the meibum of controls.[5] Specifically, cholesterol esters were always present in the glands of patients with MGD but not necessarily in normal controls.[6]
Recent research postulates that increased cholesterol in meibum may play a role in the pathology of MGD.[7] Cholesterol esters may even be a consequence of the dysfunction rather than its cause.
Chhaadva *et al*, stated that,organic substances with a greater number of saturated bonds or larger side chains have higher melting points.[8] This concept can explain why the melting point of normal meibomian secretions ranges from 30 to 34°C, while cholesterol, with its numerous structural differences, has a typical melting point of 148°C.[3]

Villani *et al* in his study showed that age-related changes of the meibomian gland using *in vivo* laser scanning confocal microscopy which is similar to our study, we found a strong association between increasing age and severity of MGD.

Their work demonstrated that meibomian gland density and diameter significantly decreased with age. This observation is also consistent with the results obtained by Bukhari *et al*.[9] and Punit Briach *et al*.[10] study.

The prevalence of dyslipidemia in the general population is well described by current literature,[9] which extrapolated data from the National Health and Nutrition Examination Survey.

The prevalence of TC >200 mg/dL is 45.1% and TC >240 mg/dL is 15.7%. The prevalence of LDL >130 mg/dL is 32.8%, HDL <40 mg/dL is 15.5%, and TGs >150 mg/dL is 33.1%.[11]
The number of MGD patients with TC <200 mg/dL and >200 mg/dL in our study were 67 (74.44%) and 23 (25.56%), respectively. Maximum number of patients with TC <200 mg/dL belonged to stage 2, while maximum number of patients with TC >200 mg/dL belonged to stage 3. As the *P* value is <0.0001, it indicates a strong association between hypercholesterolemia (levels >200 mg/dL) and increasing severity of stage of MGD. This is consistent with the findings obtained in the studies conducted by Dao *et al*.[12] and Bukhari *et al*.[9]

The number of MGD patients with LDL cholesterol <130 mg/dL and >130 mg/dL were 65 (72.22%) and 25 (27.78%), respectively
Maximum number of patients belonged to stage 2, whereas stage 4 had the least number of patients. Maximum number of patients with LDL cholesterol <130 mg/dL in our study belonged to stage 2, while maximum number of patients with LDL cholesterol >130 mg/dL belonged to stage 3. Because the *P* value is <0.0001, it indicates a strong association between increased LDL (levels >130 mg/dL) and increasing severity of stage of MGD. This observation is also consistent with the findings of all the previous mentioned studies.[13]

Maximum number of patients in our study belonged to stage 2, whereas stage 4 had the least number of patients. However, maximum number of patients with HDL cholesterol <40 mg/dL in our study belonged to stage 2, while maximum number of patients with HDL cholesterol >40 mg/dL belonged to stage 3. As the *P* value is 0.012 (<0.012), it indicates a fairly strong association between increased HDL (levels <40 mg/dL) and increasing severity of stage of MGD. [9,10]

Their study was concluded with the observation that the component which contributed most to hypercholesterolemia found in moderate-to-severe MGD patients was increased HDL levels. This presents as a surprise, as elevated HDL has not yet been associated with any pathological state. Abnormal systemic lipid processing maybe the unrecognized cause of elevated HDL levels in such patients.

TG levels were found to be significantly associated with increasing severity of MGD, in our study.
All the other studies found increased TGs in moderate and severe MGD cases, but could not reach statistical significance. Meibomian gland secretions contain TGs in addition to cholesterol, which is known to constitute 1–2% of the normal meibomian glands secretions, and the increase in serum TGs might have a role in increasing the meibum melting point and increasing its viscosity.

Our study has found out that patients with higher stages of MGD more often had serum TGs >150 mg/dL, TC >200 mg/dL, an LDL >130 mg/dL, and serum HDL >40 mg/dL, and there exists an association between increasing stage of MGD, and age, female sex, and increasing values of all the lipid profile components.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 08, 2023

However, a prospective observational study, as ours, cannot establish a "cause and effect" relationship. A larger prospective study is required to show that abnormal serum cholesterol levels can cause MGD. Secondly, the etiology of MGD is unknown and may be multifactorial. Thirdly, the sample size was small, obviating the need for larger studies to further strengthen this observation. Fourthly, all the participants in our study were Indians, limiting the generalize ability of this study.

MGD may be a possible marker of yet undiagnosed hypercholesterolemia, regardless the type of cholesterol involved, either "bad" or "good." Moreover, if a causal relationship between dyslipidemia and MGD is proved by prospective studies, oral lipid-lowering medications may be tried by clinicians for the treatment of MGD. Further studies are needed to evaluate the effect of controlling serum triglyceride and LDL levels on controlling MGD.

Nichols *et al* stated that MGD had become recognized as the major cause of evaporative dry eye. More than half of patients are above 45years followed by 31-45 and 15-30years.More than half of the patients are males.

In the present study, more than half (59%) of patients were above 45 years followed by 31-45 (32%) and 15-30 (9%) years.
Sullivan *et al* (2006) also showed significant alterations in older versus younger individuals' polar and neutral lipid profiles derived from meibomian gland secretions by highperformance liquid chromatography or mass spectrometry.

In the present study, borderline cholesterol was present in 55% of the cases having grade II severity of meibomitis. In patients with high cholesterol level, 50% had grade III severity of meibomitis whereas 25% of cases had grade I and grade II respectively.

The association between TG level and severity of meibomitis was found to be statistically significant (p=0.0001).
There was no significant (p>0.05) association of serum HDL level with severity of meibomitis. However, serum LDL level was found to be significantly (p=0.008) associated with severity of meibomitis. The relationship between plasma lipid status and meibomian gland health remains unclear and warrants investigation [14].

Therefore, the role of dyslipidemia in the development of MGD remains a grey area [15].
In spite of this, these studies provide useful insights into the potential effects of dysregulated systemic lipid metabolism on the MG, with shared similarities in their approach to examine whether a relationship exists between MGD and dyslipidemia [11].

The most relevant observation across all but one of the studies was the finding that patients with MGD had a high prevalence of dyslipidemia relative to controls [16].

This study concluded that dyslipidemia, associated with increased triglycerides (TG) and total cholesterol (TC) levels, was associated with MGD. However, we could not detect any statistically significant correlation between the MGD and other cholesterol types. This is consistent with the findings obtained in the studies conducted by Pinna *et al*. (5), Guliani *et al*. (17) and Briach *et al*. (10).

Furthermore, they found LDL levels associated with MGD, however in our study there was no significant correlation between LDL levels and MGD severity.

Dao *et al*. (4) and Pinna *et al*. (15) also detected a higher prevalence of dyslipidemia among patients with MGD, this was in relation mainly to total cholesterol to be similar to our study. But, they found a relationship between MGD and high HDL levels and concluded that dyslipidemia, which increases HDL levels, may be a risk factor for the development of MGD.
However, elevated HDL has not yet been associated with any pathological condition. Furthermore, elevated total cholesterol levels in their study might have been affected by elevated HDL levels.
Guliani *et al*. (17) in contrast detected a relationship between MGD and low HDL levels.

CONCLUSION

Meibomian gland dysfunction in the most common cause for posterior blepharitis which is found to have very strong association with increasing levels of all the components f lipid profile namely LDL,HDL, Total cholesterol and Triglycerides.

The present study showed a positive association between increasing age and increasing severity of stage of MSG and also between female sex and increasing severity of MGD.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 08, 2023

The present study helps to investigate the patients with MGD to rule out for dyslipidemia and treat them accordingly.

Acknowledgement
The author is thankful to Department of Ophthalmology for providing all the facilities to carry out this work.

Conflict of Interest None
Funding Support Nil

REFRENCES

1. Sullivan BD, Evans JE, Dana MR, Sullivan DA. Influence of aging on the polar and neutral lipid profiles in human meibomian gland secretions. Archives of ophthalmology.2006 Sep 1;124(9):1286-92.
2. Jester JV, Brown DJ. Wakayama Symposium: Peroxisome proliferator-activated receptor-gamma (PPARY) and meibomian gland dysfunction. The ocular surface. 2012 Oct1:10(4):224-9.
3. Nien CJ, Massei S, Lin G, Nabavi C, Tao J, Brown DJ, Paugh JR, Jester JV. Effects of age and dysfunction on human meibomian glands. Archives of ophthalmology. 2011 Apr 11:129(4) 462-9
4. Call M, Fischesser K, Lunn M, Kao W. Notch regulation of PPAR-gamma and development of meibomian gland dysfunction. Investigative Ophthalmology & VisualScience. 2013 Jun 16;54(15):924-
5. Suhalim JL, Parfitt GJ, Xie Y, *et al*. Effect of desiccating stress on mouse meibomiangland function.
6. Palaniappan CK, Schutt BS, Brauer L, *et al*. Effects of keratin and lung surfactant proteins on the surface activity of meibomian lipids. Investigative Ophthalmology & Visual Science. 2013;54(4):2571-2581.
7. Ong BL, Hodson SA, Wigham T, *et al*. Evidence for keratin proteins in normal and abnormal human meibomian fluids. Current Eye Research. 1991;10(12):1113-1119.
8. Lavker RM. Label-retaining Cells (LRCS) Are Preferentially Located in the Ductal Epithelium of the Meibomian Gland: Implications on the Mucocutaneous Junctional (MCJ) Epithelium of the Eyelid. Investigative Ophthalmology & Visual Science. 2003;44:3781.
9. Mort RL, Ramaesh T, Kleinjan DA, *et al*. Mosaic analysis of stem cell function and wound healing in the mouse corneal epithelium. BMC Developmental Biology. 2009;9.4.
10. Kim BJ, Ryu IH, Kim SW. Age-related differences in corneal epithelial thickness measurements with anterior segment optical coherence tomography, Japanese Journal ofOphthalmology. 2016;60(5):357-364.
11. Galor A. MGD: Definition Versus Dry Eye Disease, Risk Factors. Current OphthalmologyReports, 2014;2(2):58-64.
12. Bron AJ, Tiffany JM. The contribution of meibomian disease to dry eye. The OcularSurface. 2004;2(2):149-165.
13. Sullivan DA, Sullivan BD, Evans JE, *et al*. Androgen deficiency. Meibomian gland dysfunction, and evaporative dry eye. Annals of the New York Academy of Sciences,2002,966:211-222.
14. Samarawickrama C, Chew S, Watson S. Retinoic acid and the ocular surface. Survey of Ophthalmology. 2015;60(3):183-195.
15. Alghamdi WM, Markoulli M, Holden BA, *et al*. Impact of duration of contact lens wear on the structure and function of the meibomian glands. Ophthalmic & Physiological Optics: The Journal of the British College of Ophthalmic Opticians, 2016;38(2):120-131.
16. Khandelwal P, Liu S, Sullivan DA, Androgen regulation of gene expression in human meibomian gland and conjunctival epithelial cells. Molecular Vision. 2012;18:1055-1067.
17. Olami Y, Zajicek G, Cogan M, *et al*. Tumover and migration of meibomian gland cells in rats' eyelids. Ophthalmic Research. 2001;33(3):170-175.