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**Original Article**

# Association of Meibomian Gland Dysfunction with Serum Lipid Profile: A Hospital-based Cross-sectional study

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## ABSTRACT

**Introduction**: Meibomian gland dysfunction (MGD) frequently leads to ocular surface disease, yet its impact on patients' overall health is often overlooked. With increase in sedentary lifestyle, decreased physical activities and exposure to the digital world people have been facing increasing incidence of dyslipidemia.

**Objectives**: To investigate the association between serum lipid profile with severity of meibomian gland dysfunction.

**Materials and methods**: This was an observational, analytical, cross-sectional study carried out in the department of Ophthalmology of Shree Birendra hospital from January 2019 to January 2020. Oxford grading scale was used to grade the severity of MGD as none (grade 0), mild (grade I and II), moderate (grade III), and severe (grade IV and V). Serum lipid profile was obtained from all patients with MGD and analysis was carried out.

**Results**: Among 100 patients in this study majority of the participants were from the age group 61-70 (n, 40%) among whom 54 (54%) were females and 46 (46%) were males. Statistically significant association was noted between increase in total cholesterol, LDL, and TG levels with severity of MGD. However no significant association was found between HDL and the stage of MGD.

**Conclusion**: This study demonstrated that patients with increasing severity of meibomian gland dysfunction had greater abnormalities in their serum lipid profiles with respect to total cholesterol, LDL and triglycerides.

**Key words**: Dyslipidemia, lipid profile, Meibomian gland dysfunction

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## INTRODUCTION

Abnormal lipid level is one of the emerging risks of death in the population of today's world. Studies have shown a link between increased cholesterol and meibomian gland dysfunction (MGD). MGD is a common cause of ocular surface disease, yet its impact on patients' overall health is often overlooked. With increase in sedentary lifestyle, decreased physical activities and exposure to the digital world, people have been facing increasing incidence of dyslipidemia (Guliani, 2018). As the systemic diseases affect the eyes, it is the duty of ophthalmologists to take care of it at the initial phase. We aim to investigate the association between serum lipid profiles with severity of meibomian gland dysfunction.

## MATERIALS AND METHODS

This was an observational, analytical, cross-sectional study carried out in the outpatient department (OPD) of Ophthalmology of Shree Birendra hospital (SBH) from January 2019 to January 2020 after obtaining ethical approval from the institutional review committee of the hospital (IRC Ref number: 245). All patients with meibomian gland dysfunction aged between 20-70 years attending Eye OPD in SBH were included in the study. Cochran's formula was used to calculate a representative sample for proportion: $n = n_0 / 1 + (n_0-1)/ N$, where $n_0$ is the sample size derived from the above expression and N is the population size. Since patient records with MGD in SBH OPD last year in fiscal year 2074-75 was 135, the representative sample size was: $n = 384 / 1+ (384-1) / 135 = 100$. Inclusion criteria included patients of meibomian gland dysfunction. Exclusion criteria included patients who denied to participate in the study, history of dyslipidemia or intake of lipid-lowering drugs, patients who had undergone any ocular surgery in past six weeks, patients receiving topical medications for glaucoma, and patients who have received topical ophthalmic steroids in past four weeks. Uncounted corneal staining was performed using a non-specified technique. A strip of sodium fluorescein, available commercially as "Fluostrip" (Contacare Ophthalmics and Diagnostics in Gujarat, India) was dampened with saline. After shaking off any extra saline, the strip was put onto the underside of the lower eyelid. The staining pattern was assessed under a slit lamp at ×16 magnification within a 2-minute timeframe. The staging of MGD followed the guidelines outlined by the International Workshop on Meibomian Gland Dysfunction (Table 1). Dyslipidemia was defined as any of the following: Hypercholesterolemia – Total Cholesterol >200 mg/dl , Hypertriglyceridemia – Triglyceride >150 mg/dl, High Levels Of LDL – > 100 mg/dl, and Low Levels Of HDL – < 40 mg/dl. (Nelson, 2011)

We entered proforma based collected data into Microsoft Excel and imported it into STATA version 17 software (StataCorp, College Station, TX, USA). STATA was used for cleaning, coding and statistical analysis. We presented parametric numerical variables as mean and standard deviation, categorical variables as frequency and percentage. Normality of data was checked by mean, standard deviation and Shapiro-Wilk test. Results obtained were presented in tables, graphs, and diagrams. Data were analyzed using the Analysis of Variance (ANOVA) test followed by Tukey's post hoc analysis. A P value <0.05 was considered statistically significant.

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**Table 1: Staging of meibomian gland dysfunction according to the international workshop on meibomian gland dysfunction** (Nelson, 2011)

| Stage | MGD grade | Symptoms | Corneal staining |
|---|---|---|---|
| 1 | +(minimally altered expressibility and secretion quality) | None | None |
| 2 | ++(mildly altered expressibility and secretion quality) | Minimal to mild | None to limited |
| 3 | +++(moderately altered expressibility and secretion quality) | Moderate | Mild to moderate,mainly peripheral |
| 4 | ++++(severely altered expressibility and secretion quality) | Marked | Marked; central in addition |

**RESULTS**

Among 100 patients in this study majority of the participants were from the age group 61-70 (40%) among whom 54 (54%) were females and 46 (46%) were males (Figure 1). Majority of the patients were soldiers in our study followed by housewives (Figure 2).

There was a statistically significant association between increase in total cholesterol, LDL and TG levels with severity of MGD (Table 2). However there was no significant association with HDL with the stage of MGD.
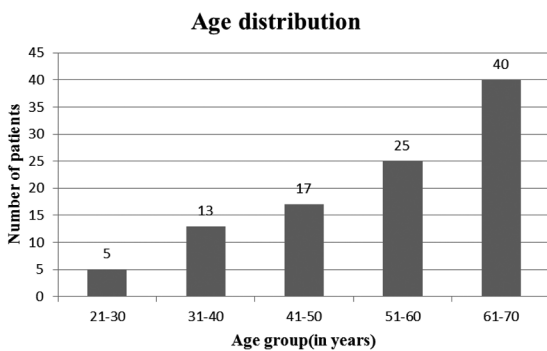


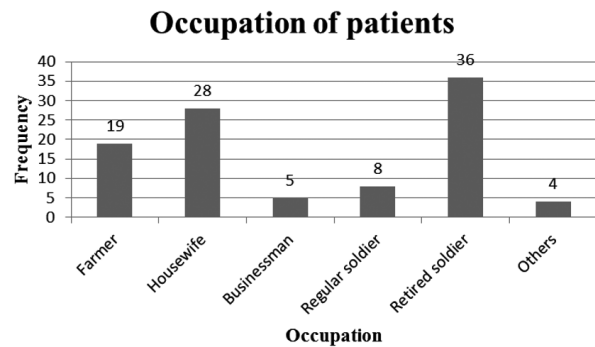**Figure 1: Age distribution of meibomian gland dysfunction patients**



**Figure 2: Distribution of meibomian gland dysfunction patients according to occupation**

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**Table 2: Comparison of different lipid parameters with various stages of meibomian gland dysfunction**

| Parameters | Stage 1 (mean± SD) | Stage 2 (mean± SD) | Stage 3 (mean± SD) | Stage 4 (mean± SD) | P value* |
|---|---|---|---|---|---|
| Frequency | 14 | 22 | 25 | 39 | |
| Total Cholesterol (mg/dl) | 152.25± 46.17 | 196.31±41.01 | 204.14±44.49 | 215.72±58.19 | <0.01 |
| HDL (mg/dl) | 57.01± 16.02 | 50.18±14.50 | 46.08±11.04 | 50.45±12.09 | 0.265 |
| LDL (mg/dl) | 91.50±30.08 | 127.99±30.93 | 126.32±28.89 | 133.44±30.92 | <0.01 |
| TG (mg/dl) | 130.55±24.87 | 135.98±39.96 | 152.57±24.27 | 154.60±43.84 | 0.017 |

*P value obtained with one way Anova test

## DISCUSSION

MGD is a common chronic condition, affecting millions worldwide, and is one of the most frequent pathologies observed on a daily basis by eye specialists throughout the world. Recent literature reports wide variations in the prevalence of MGD, with rates ranging from 3.5% to 70% in clinical and population based studies (Jie, 2009).

Research has suggested that elevated cholesterol levels within the glandular secretion might contribute to the development of Meibomian Gland Dysfunction (Krenzer, 2000; Driver, 1996). The melting points of normal meibum and cholesterol are $30^0C$ to $34^0C$ and $148^0C$ respectively. A higher cholesterol concentration in meibum would increase the melting point of meibum, increasing its viscosity and causing meibomian gland plugging.

Just like our research, the studies conducted by Dao et al (2010) and Bukhari et al (2013) demonstrated a robust connection between hypercholesterolemia (levels exceeding 200 mg/dL) and the escalating severity of MGD stages . Antonia Pinna et al (2013) conducted a study which concluded that patients with MGD and hypercholesterolemia may have higher blood low density lipoprotein (LDL) levels than controls without MGD. Gotumukkalla et al (2018) also found a statistically significant elevation of LDL (p = 0.046) in MGD patients when compared to controls. In a study done by Bukhari et al (2013) it was found that elevated LDL was present in 17.1% of grade I MGD, 29.3% of grade II MGD and 35.7% of grade III MGD. Another study by Kumar et al (2016) showed elevated LDL in 46 out of 50 cases which was statistically significant (p <0.015) .

In a study by Gulliani et al (2018), association of severity of MGD with dyslipidemia in Indian population was studied where the results showed that patients with serum triglycerides <150 mg/dL and >150 mg/dL were 53 (58.89%) and 37 (41.11%) respectively. Another study by Kumar et al (2017) also studied serum lipid profile in MGD where serum triglyceride was elevated in 94% of MGD cases. Similar study by Bukhari et al (2013) found high triglycerides in 5.7% of grade I MGD, 14.6% of grade II MGD and 39.3% of grade III MGD patients which was statistically significant.

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## CONCLUSION

This demonstrated that patients with increasing severity of meibomian gland dysfunction had greater abnormalities in their serum lipid profiles with respect to total cholesterol, LDL and triglycerides. We recommend evaluation and management of serum lipid status of every patient with MGD.

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