



## ASSOCIATION OF SERUM LIPID LEVELS WITH DIABETIC RETINOPATHY

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**ABSTRACT**

**AIM:**To study the association of serum lipids with retinal hard exudates formation, occurrence of clinically significant macular oedema (CSME) and severity of diabetic retinopathy (DR) in type 2 diabetes

**METHODS:**Type 2 diabetic patients seeking ocular evaluation for diabetic retinopathy were included in this cross-sectional study. They were assessed for presence and severity of diabetic retinopathy (DR), presence of hard exudates, clinically significant macular oedema (CSME). Retinal findings were correlated to serum lipids levels.

**RESULTS:**Totally 100 patients were included, of which 42/100 had diabetic retinopathy of any grade. Retinal hard exudates formation was found to have statistically significant correlation with the presence of dyslipidemia ( $p=0.02$ ), increased cholesterol ( $p=0.002$ ) and LDL levels ( $p=0.001$ ). The occurrence of CSME showed a statistically significant correlation with dyslipidemia ( $p=0.04$ ) and increased LDL levels ( $p=0.04$ ). Neither occurrence of dyslipidemia nor the increased levels of the various components of serum lipids showed a statistically significant correlation with high Triglyceride levels or Low HDL-C or increasing severity of diabetic retinopathy

**CONCLUSION:**Elevated serum lipids showed a significant association with retinal hard exudate formation, CSME in type 2 diabetics. Lipid lowering agents may help in reducing the occurrence of these retinal findings in diabetic patients.

**KEYWORDS :** Lipid, retinopathy, diabetic**INTRODUCTION:**

Diabetic retinopathy, one of the most common microvascular complications of diabetes mellitus, was the foremost cause of blindness in the working age group. World wide prevalence of DR was expected to increase to 5.4% by 2025<sup>1</sup>.

Diabetes Control and Complications Trial reporter that only ~11% of total risk of DR could be explained by glycemic exposure, and the remaining 89% might be generated by other potential factors<sup>2</sup>

In 1952, Kieding et al, firstly had reported the involvement of serum lipids in the progression of DR. In Early Treatment Diabetic Retinopathy Study (ETDRS), elevated serum lipid levels were reported to be associated with retinal hard exudates. The aim of the study is to evaluate the relationship between various components of serum lipids with DR<sup>3</sup>.

High serum lipid levels have also been proposed as a risk factor for DR. High lipid levels are known to cause endothelial dysfunction due to a reduced bioavailability of nitric oxide and this endothelial dysfunction was suggested to play a role in retinal exudate formation in DR<sup>4</sup>.

It was also reported that the peroxidation of lipids in lipoproteins in the vascular wall leads to local production of reactive carbonyl species that mediate recruitment of macrophages, cellular activation and proliferation, and also chemical modification of vascular proteins by advanced lipoxidation end-products which affect both the structure and function of the vascular wall<sup>5</sup>.

Consequently, it was proposed that, hyperlipidaemia might contribute to DR and macular edema (ME) by endothelial

dysfunction and breakdown of the bloodretinal barrier leading to exudation of serum lipids and lipoproteins

**AIM OF THE STUDY**

To study the association of serum lipids with retinal hard exudates formation, occurrence of clinically significant macular oedema (CSME) and severity of diabetic retinopathy (DR) in type 2 diabetes.

**MATERIALS AND METHODS:**

This is a hospital based prospective study conducted in Government Regional Eye Hospital, Visakhapatnam. Duration of the study is from September 2020 to March 2021, with study population of 100.

Patients diagnosed with diabetes mellitus Type 2 diabetes willing to undergo dilated fundus examination and fundus photographs were included in the study. Patients having any active infection, co-existing ocular disorders (uveitis, hazy media), retinal disorders like retinal vessel occlusions, retinitis pigmentosa, patients on lipid lowering agents, recent ocular surgeries (< 6 months duration) and hypertension were excluded from the study. Best-corrected visual acuity (BCVA) was assessed using illuminated Snellen's chart. Detailed funduscopy was done both with indirect ophthalmoscope with 20D lens and slit lamp biomicroscope with 78D lens. Fundus photographs taken.

**Patients were divided into two groups;**

Group 0: without retinopathy,

Group 1: with retinopathy of any stage.

Patients with DR were further grouped using the modified Early Treatment of Diabetic Retinopathy Study (ETDRS) protocol as follows:

Group 1 patient with mild-moderate non-proliferative diabetic retinopathy (NPDR),

Group 2 patients with severe NPDR and Group 3 patients with proliferative diabetic retinopathy (PDR). Patients were assessed for the presence of clinically significant macular edema using slit-lamp biomicroscopy assessment with a 78D lens. The definition utilized in diagnosing CSME was the presence of one or more of the following:

1. Retinal thickening at or within 500 microns of centre of macula.
2. Hard exudates at or within 500 microns of centre of the macula if associated with adjacent retinal thickening.
3. Zone or zones of retinal thickening 1-disc area in size, at least part of which is within one-disc diameter of centre of macula.

Patients were then grouped as either Group 0 no retinopathy, Group 1 retinopathy present but no features of CSME and Group 2 CSME present.

Serum lipid measurements were done using fasting samples, to analyse total cholesterol, cholesterol components and triglycerides. For the purpose of analysis dyslipidaemia was defined as serum total cholesterol >160mg/dl, Triglyceride levels >150mg/dl, LDL levels >100mg/dl and HDL <40 for men and <50 for women mg/dl.

**RESULTS:**

Total 100 patients fulfilling the inclusion criteria were included in the study.

Age range is of 35-80 and mean Standard Deviation (SD) of 56.41 (+9.91) years.

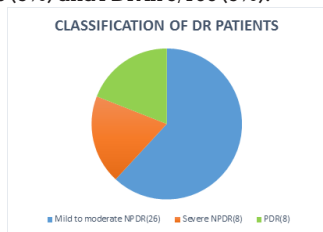
Male to female ratio is 1.27:1

**Table 1: Sex Distribution Of The Patients**

sex	No. of patients
Males	56
Females	44

Dyslipidemia was present in 45/100 (45%) patients.

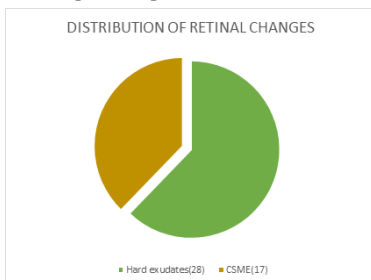
Diabetic retinopathy of any severity was found in 42/100 (42%) patients, with mild to moderate NPDR in 26/100 (26%), severe NPDR in 8/100 (8%) and PDR in 8/100 (8%).



**Figure 1: Classification Of Dr Patients**

**DISTRIBUTION OF RETINAL CHANGES:**

Out of 42 patients hard exudates and CSME were seen in 28 and 17 patients respectively.



**Figure 2: Distribution Of Retinal Changes Among The Patients**

**LIPID PARAMETERS AND DIABETIC RETINOPATHY:**

**Table 2: distribution Of Retinal Changes With Lipid Parameters**

Serum lipid levels	Retinal hard exudates	CSME
High Total Cholesterol	14/28 (50%)	9/17(52.9%)
High LDL-C	22/28 (78.5%)	11/17(64.7%)
High TG	18/28(64.7%)	3/17(17.6%)
Low HDL	6/28(21.4%)	2/17(11.7%)

Results were analysed using Anova test. Retinal hard exudates formation was found to have statistically significant correlation with the presence of dyslipidemia (p=0.02), increased cholesterol (p=0.002) and LDL levels (p=0.001). The occurrence of CSME showed a statistically significant correlation with dyslipidemia (p=0.04) and increased LDL levels (p=0.04).

Neither occurrence of dyslipidemia nor the increased levels of the various components of serum lipids showed a statistically significant correlation with high Triglyceride levels or Low HDL-C or increasing severity of diabetic retinopathy.

**DISCUSSION**

The prevalence of diabetic retinopathy in our study was 42%. Similar results were found in studies conducted by Jyothi Idiculla et al, which have shown prevalence of 42.7%<sup>7</sup>.

In our study we have found that elevated total cholesterol was significantly associated with retinal hard exudates. Elevated LDL cholesterol and presence of dyslipidemia showed association with CSME and retinal hard exudates. These find concurrence with studies like the ETDRS<sup>8</sup> and WESDR<sup>9</sup>. Like the results of our study, the WESDR study did not find a correlation between serum lipids and the increasing severity of diabetic retinopathy.

Some recent studies have shown lipid lowering drugs to significantly cause regression of hard exudate deposits and improvement in vision<sup>10</sup>

ETDRS report, Chew et al stated that patients with high total cholesterol and LDL levels were more likely to have retinal hard exudates compared to patients with normal lipid profile<sup>8</sup> Hove et al reported no significant association between DR, triglycerides, HDL and total cholesterol in diabetic population in Denmark<sup>11</sup>

On the contrary, in the Chennai Urban Rural Epidemiology Study, Rema et al showed that mean cholesterol, triglyceride and non-HDL levels were higher in patients with DR compared to those without DR<sup>12</sup>

Other studies showed that retinal exudates or ME was associated either with LDL or total cholesterol, or both<sup>13</sup>

**CONCLUSION**

- Our study findings have added to the growing evidence that dyslipidemia and specifically increased total cholesterol and LDL are significant risk for the development of retinal hard exudates and CSME.
- However, there was no significant association between serum lipids and severity of diabetic retinopathy.
- Lipid lowering agents may help in reducing the occurrence of these retinal changes.

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