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A study on Diabetic Retinopathy and Association of lipid Profile with Severity of Diabetic Retinopathy among Type 2 Diabetes Mellitus Patients: A Cross-Sectional Study

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Abstract

Background: Diabetes mellitus (DM) is a metabolic disease characterized by persistently high blood glucose levels due to the body's inability to produce or effectively use insulin. Insulin is a hormone that regulates blood glucose, and in diabetes, either not enough insulin is produced, or the body's cells don't respond properly to the insulin that is produced. This leads to an accumulation of glucose in the bloodstream, which can cause various health complications over time. **Aims & Objective**: To A study on Diabetic Retinopathy and Association of lipid Profile with Severity of Diabetic Retinopathy among Type 2 Diabetes Mellitus Patients. **Materials and Methods**: 220 participants were selected for this study and patients with type 2 diabetes mellitus were segregated into 2 categories: - First category of patients with diabetic retinopathy and second category of patients without diabetic retinopathy. Serum lipid levels of subjects were measured and its association with Diabetic Retinopathy were estimated **Results**: Prevalence of dyslipidaemia in our study was 76.36 % (168 patients). Mean ± SD of LDL(mg/dL) in diabetic retinopathy was 121.91 ± 42.22 and 107.77 ± 41.31 mg/dl in patients without diabetic retinopathy. Thus, significant association was seen between serum LDL levels and diabetic retinopathy. (p=0.008) Mean ± SD of HDL (mg/dL) in patients with diabetic retinopathy was 38.02 ± 6.43 mg/dl and in patients without diabetic retinopathy was 38.34 ± 8.5 mg/dl with no significant association between them. (p=0.9). **Conclusion**: Elevated LDL levels are significantly associated with diabetic retinopathy in patients with type 2 diabetes, and this association may be linked to endothelial dysfunction. Additionally, social factors like education status can also play a role in the occurrence of diabetic retinopathy.

KEYWORDS: Diabetic Retinopathy, LDL, HDL.

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disease characterized by persistently high blood glucose levels due to the body's inability to produce or effectively use insulin. Insulin is a hormone that regulates blood glucose, and in diabetes, either not enough insulin is produced, or the body's cells don't respond properly to the insulin

that is produced. This leads to an accumulation of glucose in the bloodstream, which can cause various health complications over time[1]

In India, there are estimated 77 million people above the age of 18 years are suffering from diabetes (type 2) and nearly 25 million are prediabetics (at a higher risk of developing diabetes in near future[2,3].

The ICMR-INDIAB study revealed a high prevalence of diabetes in India, with over 101 million people having diabetes and 136 million being pre-diabetic. The study found that Goa had the highest prevalence of diabetes (26.4%), followed by Puducherry (26.3%) and Kerala (25.5%). Uttar Pradesh had the lowest prevalence (4.8%).[5-7]

The high prevalence of diabetes in India poses a significant challenge to the country's public health infrastructure[8-10].

Diabetic retinopathy is a serious complication of diabetes that affects the blood vessels in the retina (the light-sensitive tissue at the back of the eye). It can lead to vision loss and blindness if left untreated. Early detection and treatment are crucial to slowing or preventing vision damage [9]

Diabetic retinopathy is a serious eye condition that can cause vision loss due to damage to the retina's blood vessels, a key area of the eye responsible for converting light into signals the brain understands[10-13]. This damage, often caused by high blood sugar levels associated with diabetes, can lead to a range of vision problems, including blurred vision, floaters, and even blindness[14-16].

Various studies have shown a positive correlation between elevated serum lipids (TG, LDL, TC) and macrovascular complications like ischemic heart disease. However, studies of association of elevated serum lipids with microvascular complications like diabetic retinopathy (DR) have shown varying results. In this study attempt has been made to quantify and specify the role of various components of serum lipids with the prevalence of DR (Diabetic Retinopathy)

METHODOLOGY

The study was conducte in tertiary hospital. After obtaining institutional ethical committee approval It was an Observational cross sectional

Initially 250 patient were enrolled in this study due to technical reason and eligible criteria not fulfilling by some candidates only 220 participants were eligible for analysis and study conducted on 220 patients with Diabetes Mellitus in the department of Ophthalmology, at a tertiary care centre, from April 2021 to October 2021.

The institute Ethics Committee approval was obtained before starting the sample collection. A written and informed consent was taken from the patient regarding the study in his/her vernacular language and English. In this study Patients were subjected to: A detailed history of sign & symptoms and its duration. Detailed history of systemic diseases and its duration, medication were noted. Patients were subjected to General physical examination, and ocular examination.

The results of these 220 patients were collected, tabulated and analysed.

Inclusion Criteria: All newly diagnosed cases of diabetes mellitus (irrespective of age, sex, type, duration of disease) were included.

Exclusion Criteria: Diabetic patients (i) who had other systemic diseases like Renal Diseases, Hypertension, Tuberculosis and coagulopathies etc. (ii) those having history of any previous intraocular surgery except, Cataract surgery were excluded from study.

The data collected was entered in excel spread sheet. The data was analysed by using SPSS statistical software version 20. Statistical analysis in the form of percentages was done. Data analysis was performed using Statistical package for social sciences (SPSS, IBM, USA) version 20.0. Results were reported as mean ± standard deviation for quantitative variables.

Categorical data were compared using Chi-square test. The value of $P < 0.05$ was considered statistically significant.

RESULT

In this study Initially 250 patient were enrolled in this study due to technical reason and elible criteria not fulfilling by some candidates only 220 participants were eligible for analysis and study conducted on 220 patients with Diabetes Mellitus in the department of Ophthalmology,

Prevalence of dyslipidaemia in our study was 76.36% (168 patients). Mean ± SD of LDL (mg/dL) in diabetic retinopathy was 121.91 ± 42.22 and 107.77 ± 41.31mg/dl in patients without diabetic retinopathy. Thus significant association was seen between serum LDL levels and diabetic retinopathy.(p=0.008) Mean ± SD of HDL (mg/dL) in patients with diabetic retinopathy was 38.02 ± 6.43 mg/dl and in patients without diabetic retinopathy was38.34 ± 8.5 mg/dl with no significant association between them. (p=0.9) Mean ± SD of total cholesterol (mg/dL) in diabetic retinopathy was172.52 ± 48.51 mg/dl and in patients without diabetic retinopathy was163.39 ± 32.41 mg/dl and no significant association was seen between them. (p=0.18).

Table1: Prevalence of dyslipidaemia of study subjects

Dyslipidaemia	**Frequency**	**Percentage**
No	52	23.63%
Yes	168	76.36%
Total	220	100

Table2: Association of lipid profile with diabetic retinopathy

Lipid profile	**Diabetic retinopathy (n=100)**	**No diabetic retinopathy (n=100)**	**Total**	**P value**
Total cholesterol (mg/dL)				
Normal	75 (68.18%)	87 (77.27%)	162(77.14%)	0.139 Chi square
Deranged	35(38.5%)	25 (22.72%)	60 (28.57%)	test ,3.512
Mean ± SD	172.52 ± 48.51	163.39 ± 32.41	168.21 ± 41.21	
Median(IQR)	172(135-221)	173 (139-201)	171(135-211)	0.182 t test;1.413
Range	117-391	95-271	99-381	
HDL(mg/dL)				
Normal	42 (38.18%)	53(48.18%)	95 (86.36%)	0.512 Chi square
Deranged Mean ± SD	68 (61.18%)	57(51.81%)	125 (59.52%)	test, 0.91
	38.02 ± 6.43	38.34 ± 8.5	38.18 ± 7.52	
Median(IQR)	41(43-49)	39 (36.5-45)	41(43-47)	0.61 t test;0.4
Range	25-58	26-67	25-68	
LDL(mg/dL)				
Normal	64 (58.189%)	82 (74.5%)	146 (66.36%)	0.002 Chi square
Deranged Mean ± SD	46(41.81%)	28 (25.45%)	74 (33.63%)	test ,7.21
	121.91 ± 42.22	107.77 ± 41.31	117.20 ± 41.50	
Median(IQR)	125.1(86-151)	105 (81-131)	109(91.51-141)	0.008 t test;3.51

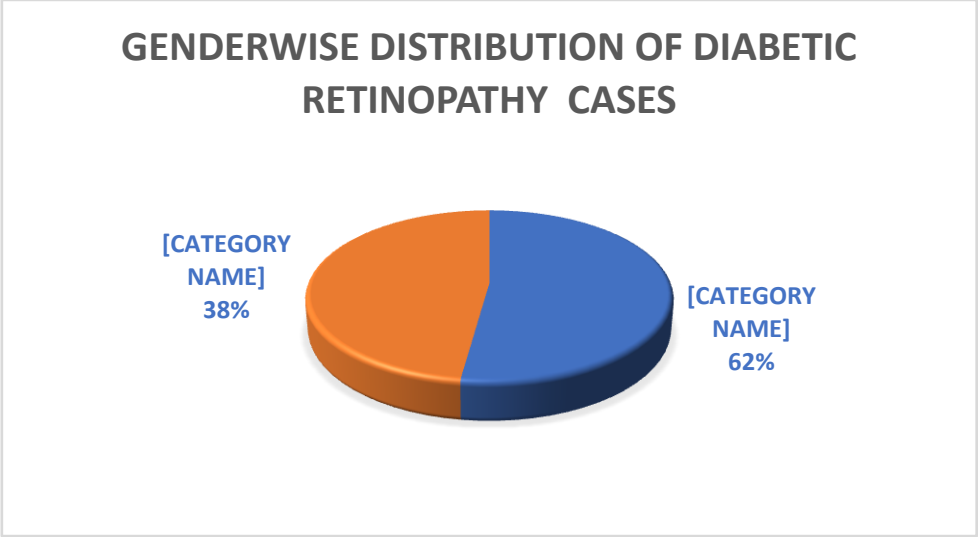

Figure 1:

In this study prevalence of Diabetic retinopathy cases among male participants were 62% and while 38% female participants were Diabetic retinopathy.

Diabetic retinopathy is slightly more prevalent in men than women. While the exact ratio varies across studies, a common finding is that the prevalence of diabetic retinopathy is higher in males compared to females. Similar result found in many studies where a male prevalence of 34.82% compared to a female prevalence of 25.01%

DISCUSSION

In this study majority of participants were suffered of Diabetic retinopathy among DM type 2. Prevalence of dyslipidaemia in our study was 76.36 %(168 patients). Mean ± SD of LDL (mg/dL) in diabetic retinopathy was 121.91 ± 42.22 and 107.77 ± 41.31 mg/dl in patients without diabetic retinopathy. Thus significant association was seen between serum LDL levels and diabetic retinopathy. (p=0.008) Mean ± SD of HDL (mg/dL) in patients with diabetic retinopathy was 38.02 ± 6.43 mg/dl and in patients without diabetic retinopathy was 38.34 ± 8.5 mg/dl with no significant association between them. (p=0.9) Mean ± SD of total cholesterol (mg/dL) in diabetic retinopathy was 172.52 ± 48.51 mg/dl and in patients without diabetic retinopathy was 163.39 ± 32.41 mg/dl and no significant association was seen between them. (p=0.18)

Various studies [17-19] have proven the role of elevated serum lipids with macro vascular complications of DM like coronary artery disease but, studies of association of lipids with specific micro vascular complications of DM like retinopathy have shown varying results. Dornan et al (1982) first showed an association of LDL cholesterol with diabetic retinopathy. In Wisconsin epidemiological study of diabetic retinopathy, Klein et al (1999) correlated raised cholesterol levels with macular hard exudates. Early treatment diabetic retinopathy study associated TC and LDL with the onset and severity of retinal hard exudates (Chew et al, 1966). Severity of retionphaty was positively associated with TG in type I DM and negatively associated with HDL choestrol in DCCT/ EDIC cohort (Lysons et al, 2004). Mohan et al (1984) reported an association between raised LDL and macular edema in the Indian population [20-22]

et al (2006) showed association of TG with DR and LDL with diabetic macular oedema in Chennai Urban Rural Epidemiology Study Eye study (CURES) 2. However, Larsson et al (1999) and Hove et al (2004) found no association between TG, TC and HDL with diabetic retinopathy. Kulshreshtha et al (1979) observed raised levels of cholesterol and NEFA (non esterified fatty acids) in patients of DR. Benarous et al (2011) reported that phospholipids are not associated with DR but with Clinically significant macular oedema. Sasongko et al (2011) showed that apolipoprotein A1 is inversely related and apolipoprotein B is directly related to DR and

are strong biomarkers of DR than lipid profile in Australian population [23] Ozer et al (2009) found no correlation between serum lipids and macular oedema in diabetic patients.
Sachdev & Sahni (2010) proved that cholesterol and LDL are risk factors for retinal hard exudates in Type II DM in North Indian population. Keech et al (2007) showed that lipid lowering agent like fenofibrate, decreases the progression of Dr. Uçgun et al (2007) showed that TC and LDL are elevated in patients with macular oedema and hard exudates. In the present study, it was found that TC, LDL and TG levels were significantly higher ($p<0.05$)
in patients of DR. The raised TG levels lead to increased blood viscosity and altered fibrinolytic activity which leads to formation of hard exudates [24]. Also, TG incorporates into the cell membrane, altering its fluidity and permeability which leads to haemorrhage and oedema.

CONCLUSION

Elevated LDL levels are significantly associated with diabetic retinopathy in patients with type 2 diabetes, and this association may be linked to endothelial dysfunction. Additionally, social factors like education status can also play a role in the occurrence of diabetic retinopathy. A statistically significant association was found between blood glucose, HbA1c, and the duration of diabetes with DR, and there was also a significant association between LDL cholesterol and the severity of NPDR. These results demonstrate the importance of monitoring lipid levels at each stage of retinopathy, which would enable effective treatment and help avoid further complications of dyslipidaemia in patients with retinopathy.
Higher LDL levels have been shown to be significantly associated with the severity of hard exudates in diabetic retinopathy.

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