The Association of Elevated Serum Lipids with Occurrence and Severity of Diabetic Retinopathy in Type II Diabetics Presenting in a Tertiary Care Hospital

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ABSTRACT

A descriptive, cross-sectional study, was conducted in the Department of Internal Medicine and Ophthalmology, Pakistan Institute of Medical Sciences, Islamabad, Pakistan, from May to November 2018. The aim was to ascertain the frequency of elevated serum lipids and diabetic retinopathy; and compare the serum lipid levels with severity of diabetic retinopathy among Type II diabetic patients. A total of 262 patients having Type II diabetes aged 35 to 65 years were included. Patients were characterised into three groups of desirable, borderline, and high-risk, based on the serum lipid profile. Direct fundoscopy/slit lamp examination was steered, and they were graded according to the severity of diabetic retinopathy. There were 42.7% and 57.3% men and women, respectively, with mean age of 52.21 years. Among the patients, 17.2% had mild, 38.9% had non-proliferative diabetic retinopathy (NPDR) and 16.4% had severe proliferative diabetic retinopathy (PDR). Only, 21.8% patients had normal lipid level and 27.5% had severe dyslipidemia. Gender did not have association with the advancement of diabetic retinopathy. However, age and hyperlipidemia showed significant association with the development and severity of diabetic retinopathy. Several risk factors play a vital role in the development, morbidity, and progression of diabetic eye disease. Age and dyslipidemia are significant factors in the severe disease.

Key Words: *Diabetic retinopathy, Dyslipidemia, Hyperglycemia, High HbA1c, Maculopathy.*

In the last decade, the incidence and prevalence of Type II diabetes in adolescents has risen considerably.[1] The leading cause of mortality worldwide, in patients with Type II diabetes is atherosclerotic cardiovascular disease (ASCVD).[2] Cardiovascular events have been found to be more common in diabetics than non-diabetics.[3] The amplified ASCVD risk in patients with diabetes was ascribed not only to aberrations in serum glucose, but also affected by atypical lipid metabolism.

Retinopathy is a major microvascular complication of diabetes mellitus, and a leading cause of blindness worldwide, characterised by increased proliferation of cellular walls of vessels, vascular occlusion, and thrombosis. There is development of microaneurysms or localised dilatations of vascular smooth muscle walls, which may later have micro-hemorrhages due to increased retinal capillary permeability or damage. One important and devastating complication is infarction, affecting the retina of the eye, leading to blindness which is irreversible.

High serum lipid level showed a momentous association with retinal hard exudate formation and subsequent loss of vision in Type II diabetics. Higher the serum lipids level, more were the hard exudates formed on the retina. High serum lipids not only increased the number of these hard exudates but also their size. This direct association also indicated that the lipid lowering agents may help in reducing the incidence of these devastating retinal findings and prevent or retard loss of vision in diabetic patients.

Higher total cholesterol and LDL levels are associated with hyper-reflective foci and hard exudates; whereas, increased total cholesterol level and triglyceride level also have a linear association with total macular volume.[4] This interesting relationship between hyperlipidemia and occurrence/severity of diabetic retinopathy, along with several other parameters, might directly or indirectly affect the integrity and functioning of retina.

A descriptive cross-sectional study was conducted amongst Type II diabetic patients aged 35 to 65 years, presenting to Pakistan Institute of Medical Sciences, Islamabad. Exclusion criteria included, pregnancy, high myopia, eye trauma or developed cataract, glaucoma, accelerated hypertension, ocular surgery during last six months, and active infection.

Table I: Association of dyslipidemia with severity of retinopathy in different age groups and gender.

		Lipids	Retinopathy				Total	p-value*
			Mild	Moderate	Severe	Proliferative retinopathy		
Age	35-45	Desirable	7	10	6	0	23	<0.001
		Borderline	11	9	2	1	23	
		High risk	2	2	1	0	5	
		Total	20	21	9	1	51	
	46-55	Desirable	9	12	7	0	28	
		Borderline	8	29	30	4	71	
		High risk	0	4	15	2	21	
		Total	17	45	52	6	120	
	56-65	Desirable	2	1	3	0	6	
		Borderline	2	4	19	14	39	
		High risk	4	1	19	22	46	
		Total	8	6	41	36	91	
Total			45	72	102	43	262	
p-value			<0.001					
Gender	Male	Desirable	9	12	4	0	25	0.969
		Borderline	8	15	28	6	57	
		High risk	1	4	16	9	30	
		Total	18	31	48	15	112	
	Female	Desirable	9	11	12	0	32	
		Borderline	13	27	23	13	76	
		High risk	5	3	19	15	42	
		Total	27	41	54	28	150	
Total			45	72	102	43	262	
p-value			0.572					

*Pearson chi-square test.

Patients were evaluated for diabetic control through HbA1C and serum lipid profile was measured. Ophthalmologist executed fundoscopy/slit lamp examination; and categorisation was done according to severity score as given in proforma.

SPSS version 20 was used for data analysis. Descriptive statistics were used for the analysis of qualitative and quantitative data. Quantitative data comprised of age of patients. Mean and standard deviation was calculated. Qualitative data included gender of patient, severity of dyslipidemia and severity of diabetic retinopathy. Frequency along percentage was calculated for each variable. Severity of diabetic retinopathy was compared with degree of dyslipidemia by Chi-square and test. Stratification was done using age and gender to control effect modifiers. Post-stratification, test of significance were applied. P <0.05 was reflected as significant.

The total study patients included were 262. Out of them, 42.7% were males and 57.3% were females, who were included in the study after random selection. Mean age was 52.21 ± 7.682 years. Age distribution is given in Table I.

There was no significant association between gender and dyslipidemia (p = 0.969).

Patients in different stages of diabetic retinopathy included mild, moderate and severe non-proliferative retinopathy (NPR), and proliferative diabetic retinopathy (PDR), as shown in Table I.

Serum lipid profile showed that 21.8% of the patients showed desirable range of lipids, 50.8% patients had border-line dyslipidemia; whereas, 27.5% of the patients had severe dyslipidemia.

Dyslipidemia and diabetic retinopathy had a significant association (p <0.01). Hence, patients having higher levels of serum lipids had worse diabetic retinopathy. To remove confounders, association between gender and dyslipidemia was also checked and there was no significant association (p = 0.572).

Age and diabetic retinopathy were also compared, which showed that increasing age (and hence probably duration of diabetes) had a significant association with retinopathy (p <0.001).

In people with Type II DM, diabetic retinopathy might be present right at the time, the diagnosis of diabetes is made. This may be due to fact that a Type II diabetic often passes years of being undiagnosed, with persistently high blood sugar level that have been damaging the retina and other vital organs of the patient. A multi-center large trial of 23,000 people with diabetes belonging to 35 different coun-

tries involving several continents (excluding Asia), and patients of different races, ethnicities, BMI, family histories and risk factors, the overall prevalence of any type of diabetic retinopathy was 35%.[5] Results of ACCORD-Eye study were consistent with those observed in the FIELD study.[6] Large-scale clinical trials have revealed that treatment with fibrates, which decrease triglyceride levels and increase levels of the HDL-C, reduces ASCVD risk in patients with Type II diabetes.

Elevated serum lipid levels have been shown to adversely affect the integrity of retina. They also predispose the patients, to premature visual loss, retinopathy, and several other retinal complications. At the same time, patients who receive prompt treatment, respond well and show better prognosis.

Therefore, early recognition and prompt treatment can be a game-changer in such a prevalent and devastating disease. In the present study, there was found a high frequency of severe dyslipidemia (27.5%) while 21.8% of the studied population had normal serum lipid levels. Moreover, 38.9% population had severe non -proliferative diabetic retinopathy, while 16.4% had severe proliferative retinopathy. Elevated serum lipid levels showed a significant association with the severity of diabetic retinopathy.

Age was also found to influence the development of diabetic retinopathy, probably due to longer duration of diabetes. This study shed light not only on the incidence of dyslipidemia, but also on the incidence and extent of diabetic retinopathy among Pakistani patients. It might prove to be of great benefit for further researchers.

CONFLICT OF INTEREST:
The author declared no conflict of interest.

PATIENTS' CONSENT:
Written patient consents were taken on approved form prior to inclusion in study.

AUTHORS' CONTRIBUTION:
AJ: Data collection, data entry, manuscript writing, and statistical analysis
HUR: Statistical analysis, proofreading, and data entry.

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