ASSOCIATION OF DYSLIPIDEMIA AND OTHER RISK FACTORS WITH DIABETIC RETINOPATHY AMONG PATIENTS OF TYPE 2 DIABETES MELLITUS

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ABSTRACT

Objective: To study the association of diabetic retinopathy (DR) with dyslipidemia in patients of type 2 diabetes mellitus and to evaluate other associated risk factors.

Study Design: Cross sectional comparative study.

Place and Duration of Study: The study was conducted at Centre for Research in Experimental and Applied Medicine-1 (CREAM-1), Department of Biochemistry and Molecular biology Army Medical College, Rawalpindi in collaboration with Armed Forces Institute of Ophthalmology (AFIO) from Apr 2016 to Jun 2016.

Material and Method: Total 180 subjects were enrolled in two groups. Group I comprised of 90 patients of diabetic retinopathy and group II of 90 healthy normal controls. Demographic and clinical data were collected. Fasting venous blood samples (5 ml) were drawn and checked for blood glucose, HbA1c and lipid profile (total cholesterol, triglycerides, high density lipoproteins and low density lipoproteins). Data collected was analyzed by SPSS version 22.

Results: Mean age of the patients was 56 ± 6 years and that of controls was 53 ± 7 years. Mean duration of DM was 14 ± 5 years. Mean systolic blood pressure of group-I was 146 ± 15 mm Hg compared to 127 ± mm Hg of group-II. Mean diastolic BP of patients was 93 ± 8 mm Hg while that of controls was 77 ± 6 mm Hg. Mean body mass index (BMI) of subjects of group-I was 28.8 ± 2.9 while for group-II, it was 25.1 ± 1.4. Mean fasting plasma glucose was 10.2 ± 3.4 mmol/l for group-I and 5.0 ± 0.6 mmol/l for group-II. HbA1c was also considerably higher for group-I with a mean of 7.2 ± 0.8% while for group-II, its mean was 5.2 ± 0.5. Total cholesterol (group-I 5.7 ± 0.9 mmol/l versus group-II 4.8 ± 0.6 mmol/l), triglycerides (group-I 3.7 ± 0.9 mmol/l and group-II 2.0 ± 0.2 mmol/l), and low density lipoproteins (group-I 3.08 ± 0.49 mmol/l and group-II 2.17 ± 0.3 mmol/l) of both the groups were compared and found significantly higher among patients of diabetic retinopathy. DR was positively correlated with poor glycemic control, hypertension, increasing age and dyslipidemia at highly significant *p*-value. There was no statistically significant difference for high density lipoproteins between the two groups.

Conclusion: Our study established statistically significant association of DR with increasing age, duration of DM, poor glycemic control, and BMI. Total cholesterol, triglycerides and low density lipoproteins were associated with diabetic retinopathy at a highly significant *p*-value. No significant association between high density lipoproteins and diabetic retinopathy was found.

Keywords: Body mass index, Diabetic retinopathy, Dyslipidemia, Diabetes mellitus, Glycemic control.

INTRODUCTION

Prevalence of diabetes mellitus (DM) was 2.8% worldwide in 2000 and is expected to reach to 4.4% in 2030. Number of patients suffering from DM is estimated to rise to 366 million in 2030 from 171 million in 2000[1]. Diabetic retinopathy (DR) is one of the most common microvascular complications of DM and can result in severe visual loss and even blindness[2].

The prevalence of DR increases with increasing age of patient, duration of diabetes and poor glycemic control[3] as all these conditions expose the patients to prolonged hyperglycemia ultimately leading to the development of DR.

Serum lipids have been reported to be a risk factor for DR and diabetic macular edema (DME). Dyslipidemia might contribute to DR and DME by dysfunction of endothelium and disruption of the blood retinal barrier resulting in exudation of serum lipids and lipoproteins[4]. Total cholesterol

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(TC), triglycerides (TGs) and low density lipoproteins-cholesterol (LDL-cholesterol) were higher in persons with DME compared with those without DME. A similar positive relationship was not observed with high density lipoprotein-cholesterol (HDL cholesterol). High LDL- cholesterol levels are toxic to the endothelial cells, whereas HDL-cholesterol has vasoprotective role, with antioxidant, vasodilatory, and anti-inflammatory effects. It also promotes the efflux of cholesterol from cells[5].

Higher body mass index (BMI) is associated with DR because of potential involvement of blood viscosity, altered platelet function, aldose reductase activity and vasoproliferative parameters e.g vascular endothelial growth factor[6].

Considering the high prevalence of DR and DM among Pakistani population, this study was done to evaluate the association of diabetic DR with dyslipidemia and other associated risk factors like gender, age, duration of DM, blood pressure, BMI, fasting blood glucose and HbA1c.

PATIENTS AND METHODS

It was a cross sectional comparative study carried out from April 2019 to June 2016. Sampling technique was non probability purposive sampling. Total sample size was 180 (calculated by WHO calculator) divided into two groups, DR cases (group-I, n=90) and normal healthy controls (group-II, n=90). In group-I, patients with DR diagnosed by an ophthalmologist were enrolled from Armed Forces Institute of Ophthalmology (AFIO) after approval from ethical review committee. Only patients of type 2 DR were recruited. In group-II, age and gender matched normal healthy individuals from general population were enrolled. Patients having non diabetic retinopathy, co-morbidity/chronic illness and patients on lipid lowering drug therapy were not included in the study.

Demographic and clinical data were collected for both groups. Fasting venous blood samples (5 ml) were collected after written informed consent. Age, gender, duration of DM, family h/o DM, BMI, and blood pressure of patients were recorded. Glycemic status was assessed by fasting blood glucose level and HbA1c levels which were estimated spectrophotometrically by microlab 300 (Biosystems, Spain) using kit method (PZ Cormey, Poland and AMS, Italy). Lipid profile was assessed using commercial kits (HDL Merck France, TG AMS, PZ Cormey, Poland) by microlab 300 (Biosystems, Spain).

Data collected were entered on and analyzed by SPSS version 22. Normally distributed numerical data were expressed as mean ± standard deviation. Categorical data was expressed by percentages and frequency charts. Student's t test was applied to compare means of

Table-I: Showing means and standard deviation of Systolic BP, Diastolic BP, BMI, BSF and HbA1c.

Characteristic	Group	Mean	Standard deviation	*p*-value
Systolic BP	Patients (n=90)	146.67	15.434	<0.001
	Controls (n=90)	127.44	6.630	
Distolic BP	Patients (n=90)	93.33	8.74	<0.001
	Controls (n=90)	77.33	6.14	
BMI	Patients (n=90)	28.81	2.94	<0.001
	Controls (n=90)	25.11	1.47	
BSF	Patients (n=90)	10.18	3.40	<0.001
	Controls (n=90)	5.09	0.58	
HbA1c	Patients (n=90)	7.27	0.81	<0.001
	Controls (n=90)	5.28	0.52	

numerical data and categorical data. Pearson's correlation was checked to determine associations between numerical variables. A *p*-value of less than 0.05 was considered statistically significant.

RESULTS

Total number of study participants was one hundred and eighty. Among them ninety were patients of DR and ninety were controls. Mean age of the patients was 56 ± 6 years and mean age of controls was 53 ± 7 years. Mean duration of DM was 14 ± 5 years. Mean systolic blood pressure, diastolic blood pressure, fasting blood sugar and HbA1c of patients and controls were compared and found significantly higher in group-I with *p*-value <0.001. The results are shown in the table-I.

Table-II: Showing results of independent t test comparing TC, TG, HDL and LDL of patients and controls.

	Patient category	Mean	Standard deviation	*p*-value
TC	Patients	5.77	0.91	<0.001
	Controls	4.80	0.62	
TG	Patients	3.76	0.91	<0.001
	Controls	2.00	0.21	
HDL	Patients	1.09	0.13	0.860
	Controls	1.08	0.13	
LDL	Patients	3.08	0.49	0.002
	Controls	2.17	0.32	

To assess the lipid profile, total cholesterol (TC), Triglyceride (TG), HDL and LDL of the patients were compared with those of controls. The results are shown in table-II.

There was a positive correlation of age with glycemic control among patients of DR (r=0.535 and *p*-value <0.001). Similarly HbA1c was positively correlated with hypertension (r=0.661 and *p*-value <0.001) and hypercholesterolemia (r=0.407 and *p*-value <0.001).

DISCUSSION

In our study, the mean age of patients of DR was fifty six years which is consistent with the studies in the past showing significant association between increasing age and DR[7]. Longer duration of DM is also an established risk factor. Mean duration of DM in our study was more than fourteen years. Studies carried out in the past revealed that prevalence of DM rises up to 25% in cases of more than fourteen years of disease while in cases of less than fourteen years duration, prevalence was 3.5%[8]. Increasing age and duration of DM lead to prolonged exposure to hyperglycemia, hence resulting in increased incidence of diabetic microvascular complications. HbA1c levels and poor glycemic control are also significantly associated with DR and this finding is consistent with other studies in the past[9].

Our study showed a significant association between hypertension and DR. Both the mean systolic and diastolic blood pressures are raised in patients of DR as compared to controls. This finding is consistent with results from other parts of the world. Olamoyegun et al[10] and Galvez-Rzui et al[11] in their studies reported similar results.

BMI is positively associated with DR in the study. Tanaka et al reported similar association in Japanese population[12]. In a study at Nigerian population by Olamoyegun et al, it was reported to be a risk factor[10] while Rasoulinejad et al reported a negative association[8] in Iranian population. Oxidative stress, release of inflammatory mediators and endothelial dysfunction in obesity play an important role in development of DR[13].

LDL, TC and TG are significantly associated with diabetic retinopathy. Similar findings were reported in other studies[14,15]. HDL is not significantly associated with DR in our study. In a study by Prakash et al HDL was inversely associated with DR[16]. Similar findings were reported by Lyons et al[15] but Rasoulinejad et al in their study reported no significant association of HDL with DR[8].

CONCLUSION

Our study revealed a significant association between diabetic retinopathy and increasing age, duration of DM, hypertension and raised levels of FBS, HbA1c, BMI, TC, TG & LDL among Pakistani population. Association between HDL and DR is not statistically significant.

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CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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