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A study of Dyslipidemia in Diabetic Retinopathy

MANJUKARTHIKEYANI K
Department of Biochemistry, THANJAVUR MEDICAL COLLEGE

Abstract : IntroductionDiabetic Retinopathy (DR) is one of the most common microvascular complications of Diabetes Mellitus (DM) and is the leading cause of preventable legal blindness in persons aged 25-74 years. The early inflammatory response in retina has been proposed to be the result of persistent hyperglycemia as well as of dyslipidemia. AIM OF THE STUDY The aim of this study is to evaluate the relationship between the various components of serum lipids with Non Proliferative and Proliferative forms of Diabetic Retinopathy. MATERIAL AND METHODS This is a cross sectional study which included 55 patients attending the Department of Ophthalmology in Government Medical College Hospital, Thanjavur for evaluation of Diabetic Retinopathy(DR). Serum Total Cholesterol (TC), Triglycerides (TGL), and High density lipoprotein Cholesterol (HDL-C) were measured using standard enzyme kits in auto analyser. Low density lipoprotein Cholesterol (LDL-C) was calculated by Friedewalds formula.RESULTS 55 patients who fulfilled the inclusion criteria were included in the analysis. Patients were divided into two groups Group 1 patient with Non-proliferative Diabetic Retinopathy (NPDR), Group 2 patients with Proliferative Diabetic Retinopathy (PDR). Out of 55 patients with Diabetic Retinopathy included in the study, 23 NPDR and 32 had PDR. The levels of TC, TGL, LDL and VLDL significantly correlate with both Non Proliferative and Proliferative retinopathy and correlation was significant at P value 0.05 . But the atherogenic index (log TGLHDL) shows strong correlation with Proliferative retinopathy than with Non proliferative retinopathy (P 0.001)DISCUSSIONDiabetes mellitus is the leading cause of blindness between the ages of 20 and 74. This cross sectional study has shown positive correlation between the severity of retinopathy, conventional plasma lipid profiles and atherogenic index. More severe retinopathy was found to be associated with higher total triglycerides levels, lower HDL cholesterol levels and higher LDL cholesterol levels CONCLUSION The findings of this study has added to the growing evidence that dyslipidemia is a risk factor for the development of both Non Proliferative and Proliferative Retinopathy in Diabetic patients

Keyword : Diabetes, Diabetic Retinopathy, Dyslipidemia, Atherogenic Index

Introduction

Diabetic Retinopathy (DR) is one of the most common microvascular complications of Diabetes Mellitus (DM) and is the leading cause of preventable legal blindness in persons aged 25-74 years1,2 . The pathogenesis of Diabetic Retinopathy is not completely understood, but established risk factors include poor glycaemic control, hypertension, increasing age, and duration of diabetes. Hyperglycaemia triggers retinal endothelial cell activation and increases leukocyte/endothelial interaction leading to breakdown of the Blood Retinal Barrier (BRB) and vascular hyper permeability. This leakage results in Diabetic macular edema, the most common cause of decreased visual acuity in diabetic patients. Later, capillary degeneration and ischemia develop which lead to uncontrolled neovascularization in an attempt to compensate for the lack of blood flow3,4. The early inflammatory response in retina has been proposed to be the result of persistent hyperglycaemia as well as of dyslipidemia5-7

The role of dyslipidemia in the development of DR has not yet been studied in details despite the clinical evidences that dyslipidemia may contribute to the pathogenesis of DR8,9 . Plasma lipids and lipoprotein patterns have also been found to be deranged in patients with type 1 and type 2 diabetes mellitus. Diabetic dyslipidemia is generally characterized by increased plasma Triglyceride (TG) and decreased high- density lipoprotein cholesterol (HDL-C) concentrations, a preponderance of Small, dense Low-Density Lipoprotein (sd LDL), and an increased apolipoprotein B concentration10. Severe hyperlipidemia in Diabetes may also lead to lipid infiltration into the retina, causing macular edema, retinal hard exudates11 and leading to blindness12. In view of the above literature, a study on the pattern of lipid profile in patients with diabetic retinopathy was done.

AIM OF THE STUDY:

The aim of this study is to evaluate the relationship between the various components of serum lipids with Non Proliferative and Proliferative forms of Diabetic Retinopathy.

MATERIAL AND METHODS:

This is a cross sectional study which included 55 patients attending the Department of Ophthalmology Government Medical College Hospital, Thanjavur (over a period of 12 months),for evaluation of Diabetic Retinopathy(DR), defined by The International Clinical Diabetic Retinopathy Severity Scale adopted by the American Academy of Ophthalmology (AAO). All subjects underwent a detailed eye examination and a dilated fundus examination with +90D lens and Indirect

Ophthalmoscopy. After informed consent all patients with Diabetic Retinopathy were done fasting lipid profile. 5 ml of venous blood was collected from the subjects after an overnight 12 hour fast. Serum Total cholesterol (TC), Triglycerides (TGL), and High density lipoprotein Cholesterol (HDL-C)were measured using standard enzyme kits in auto analyser on the same day of sample collection. Low density lipoprotein Cholesterol (LDL-C) was calculated by Friedewald's formula. Atherogenic index of plasma (AIP), calculated as log (TG/HDL-C), with TG and HDL-C expressed in molar concentrations. National cholesterol Education Program (NCEP)-Adult Treatment Panel III (ATP III) guidelines were referred. According to NCEP-ATP III guidelines, hypercholesterolemia is defined as TC > 200 mg/dl, high LDL when value >100 mg/dl, hypertriglyceridemia as TG > 150 mg/dl and low HDL when value < 40 mg/dl. Dyslipidemia was defined by the presence of one or more than one abnormal serum lipid concentrations.

Inclusion criteria were as follows:

1. All type 2 diabetes who are fit to undergo a dilated fundus examination.

Exclusion criteria were as follows:

Patients with Hypertension, Ischemic Heart Disease, Gestational Diabetes Mellitus, Media opacity and Previous history of cataract surgery were excluded from the study.

STATISTICAL ANALYSIS

All data were expressed as the mean and standard deviation. SPSS 17.0 software was used for statistical analysis. The statistical significance of biochemical parameters for the subjects were analysed by using unpaired students 't' test and $p<0.05$ was accepted as statistically significant.

RESULTS

55 patients who fulfilled the inclusion criteria were included in the analysis. Patients were divided into two groups;

Group 1 patient with Non-proliferative Diabetic Retinopathy (NPDR), Group 2 patients with Proliferative Diabetic Retinopathy (PDR). Out of 55 patients with Diabetic Retinopathy included in the study , 23 belonged to group 1, ie NPDR and 32 belonged to group 2 , ie. PDR. There were 30 males and 25 females, with age ranging between 35- 78yrs. 16 out of 23 patients had abnormal lipid profile in Non-proliferative retinopathy and 29 out of the 32 patients had abnormal lipid profile in proliferative retinopathy. Increased levels of TC, TGL, LDL and VLDL significantly correlate with both Proliferative and Non-proliferative retinopathy and correlation was significant at P value <0.05 . But the Atherogenic index (log TGL/HDL) shows strong correlation with Group 2 patients with proliferative retinopathy than with Group 1 Non proliferative retinopathy (P=0.001)

BIOCHEMICAL CHARACTERISTICS OF THE OF THE SUBJECTS WITH NON PROLIFERATIVE DIABETIC RETINOPATHY AND PROLIFERATIVE RETINOPATHY

PARAMTERS	NON PROLIFERATIVE DIABETIC RETINOPATHY Mean ± SD N=	PROLIFERATIVE RETINOPATHY Mean ± SD N=	P VALUE
TOTAL CHOLESTEROL(mg/dl)	169.60 19.88	193.50± 47.66	0.015
TRIGLYCERIDES mg/dl	111.30 ± 26.19	177.03±79.04	0.008
HDL-C (mg/dl)	42.52 ±9.64	32.65±7.54	0.007
LDL-C (mg/dl)	105.21 ±23.23	97.21±31.44	0.001
VLDL-C (mg/dl)	22.26 ± 5.8	35.37±15.53	0.008

ATHEROGENIC INDEX OF PLASMA OF THE OF THE SUBJECTS WITH NON PROLIFERATIVE DIABETIC RETINOPATHY AND PROLIFERATIVE RETINOPATHY

	Mean ± SD	P VALUE
NON PROLIFERATIVE DIABETIC RETINOPATHY	0.411941± 0.113921	0.001
PROLIFERATIVE RETINOPATHY	0.706986± 0.163801	

Atherogenic index of the of the subjects with Non Proliferative Diabetic Retinopathy and Proliferative Retinopathy shows significant correlation with p value = 0.001.

DISCUSSION

DM is the leading cause of blindness between the ages of 20 and 74. The gravity of this problem is highlighted by the finding that individuals with DM are 25 times more likely to become legally blind than individuals without DM13. Blindness is primarily the result of progressive diabetic retinopathy and clinically significant macular edema. Diabetic retinopathy is classified into two stages: Non Proliferative and Proliferative Retinopathy. The retinal arteriole shares similar anatomic and physiologic characteristics with the coronary microcirculation. Hyperlipidemia is a powerful risk factor for atherosclerosis and related disorders such as ischemic heart disease, cerebrovascular diseases and retinal atherosclerosis14,15. This cross sectional study has shown positive associations between the severity of retinopathy and conventional plasma lipid profiles & atherogenic index of plasma. The Diabetes Control and Complications Trial (DCCT) however showed a relationship with the occurrence of retinopathy and elevated very low and low density lipoproteins16 . The DCCT demonstrated that improvement of glycemic control reduced Nonproliferative and Proliferative retinopathy (47%reduction), microalbuminuria (39% reduction), clinical nephropathy(54% reduction), and neuropathy (60% reduction). More severe retinopathy was found to be associated with higher total triglyceride levels, lower HDL cholesterol levels and a trend towards higher LDL cholesterol levels.

CONCLUSION

The findings of this study has added to the growing evidence that dyslipidemia is a risk factor deciding the development of both Non proliferative and Proliferative retinopathy in diabetic patients. Some of the recent studies have shown that lipid lowering drugs do cause significant regression of hard exudate deposits in retinopathy and improvement in vision. They suggest that addition of serum lipid lowering drugs may help in preventing visual loss in diabetic patients with dyslipidemia.

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