ORIGINAL ARTICLE J. Med. Sci. (Peshawar, Print) January 2012, Vol. 20, No. 1: 37-40

COMPARATIVE LIPID PROFILE AND BLOOD PRESSURE STUDIES IN DIABETIC NON-PROLIFERATIVE AND PROLIFERATIVE RETINOPATHIC MALE PATIENTS

Nargis Parveen[1], Sahib Alam[2], Shafiqur Rahman[1], Qaiser Khan[3]

[1]Department of Physiology, Khyber Medical College, Peshawar - Pakistan

[2]Department of Agricultural Chemistry, Khyber Pakhtunkhwa Agricultural University, Peshawar - Pakistan

[3]Department of Surgery, Khyber Teaching Hospital, Peshawar - Pakistan

ABSTRACT

Objectives: To determine the serum lipid profile and blood pressure in male diabetic patients and to compare them between non-proliferative and proliferative retinopathy.

Material and Methods: A total of 150 male subjects were selected for this prospective and case control study. Four groups designated as Non Proliferative Diabetic Retinopathic (NPDR, n=48), Proliferative Diabetic Retinopathic (PDR, n= 68), diabetic Non retinopathic (CDNR, n=16) and normal Subjects (NS, n=18) were formed. Fasting serum total cholesterol, high density lipoprotein, low density lipoproteins and triglyceride levels were measured in each patient. Systolic and diastolic blood pressure values were recorded using standard methods. All the data were analysed by SPSS-16 for comparison between the groups.

Results: Serum low density lipoproteins and triglyceride concentrations were found significantly greater in all the three diabetic groups being highest in the PDR subjects. High density lipoprotein concentrations were significantly lower in the CDNR, NPDR & PDR groups as compared to NS group. Total cholesterol did not differ significantly among the groups. Similarly systolic and diastolic blood pressures were also found to be comparatively higher in the retinopathic groups.

Conclusion: Higher serum levels of LDL and triglycerides and lower levels of HDL and higher systolic and diastolic blood pressures are found in type 2 diabetes with retinopathy.

Key Words: Lipid Profile, Diabetes Mellitus, Hypertension, Diabetic Retinopathy.

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia causing significant alterations in carbohydrate, fat and protein metabolism. Diabetes results due to defects in insulin secretion (type 1) or insulin synthesis (type 2) or both[1]. It is a devastating disease in terms of long term damage, dysfunction and failure of various organs, the eye, kidney, brain and peripheral nerves[2,3]. Diabetic retinopathy (DR) is a troublesome complication as it is one of the major causes of blindness. An estimated 45 million people around the world are blind and most of them due to diabetic retinopathy; the number is expected to rise to 76 million by 2020[4].

Address for Correspondence:
Dr. Nargis Parveen
Professor
Department of Physiology,
Khyber Medical College, Peshawar - Pakistan
Tel: 091-9216206
Email: nargisparveen490@hotmail.com

There are various risk factors in the development of DR such as degree and duration of hyperglycemia, hypertension, smoking, pregnancy, nephropathy and hyperlipidemia[5,6]. The recently conducted The Action to Control Cardiovascular Risk in Diabetes (ACCORD) Eye study has concluded that an effective treatment of dyslipidemia slows progression of diabetic retinopathy[7]. Maintaining normal or near-normal blood pressure has also been shown to delay progression of retinopathy[8]. Therefore improved understanding of the role of dyslipidemia and hypertension in the development and progression of diabetic retinopathy provides an opportunity for ophthalmologists and other diabetic health care professionals to improve management strategies. The purpose of the present study is to present the evidence on the role of serum lipoprotein distribution and systolic and diastolic blood pressures values in diabetic male individuals with non-proliferative DR (NPDR) and proliferative DR (PDR).

MATERIAL AND METHODS

This was a cross-sectional study carried out in the outpatient departments of four hospitals, Khyber

Teaching Hospital, Hayatabad Medical Complex and Lady Reading Hospital, located in Peshawar City and Al-Shifa Eye Trust Hospital located in Rawalpindi City. A total of one hundred and fifty male adult subjects were included in the study. Patients' selection was purely random without any ethnic or regional consideration. Of 150 subjects recruited for the study, 132 were known Type 2 diabetes mellitus (T2DM) with visual symptoms and 18 were normal ie non-diabetic subjects (NS). Exclusion criteria were severe systemic diseases such as kidney or heart disease, liver malfunctioning, respiratory or gastrointestinal disorders.

After recording the necessary anthropometric data, each patient was assessed for retinal changes through direct ophthalmoscopic and/or fundus photographic procedures. Retinopathic patients were designated as either non-proliferative diabetic retinopathy (NPDR) defined by the presence of microaneurysm, hard exudates or macular edema or proliferative diabetic retinopathic (PDR) defined by the presence of neovascularization or vitrous hemorrhage in either eye. Diabetic but non-retinopathic (CDNR) and the normal healthy subjects (NS) were taken as positive and negative controls respectively. Venous blood samples from all subjects were withdrawn after an overnight fast of 12-14 hours and sera were separated and stored at 0°C. Serum total cholesterol (TC), triglycerides (TG), high density lipoprotein cholesterol (HDL-C) and low density lipoprotein cholesterol (LDL-C) concentrations were measured using the commercial kit (Ecoline Germany) on Autoanalyzer II (Technicon). Systolic and diastolic blood pressures (BP) were measured using the conventional mercury sphygmomanometer. Three readings were taken for each patient and values presented as arithmetic mean. Statistical analysis was done using SPSS-16. Data were represented as mean±standard deviation. P-value of less than 0.05 was taken as statistical difference of significance.

RESULTS

The total number of study population was 150 male subjects. Mean age was 48 ±12 years (range= 30-65 years). The number of patients included in each of the four groups was as follows; NS=18, CDNR=16, NPDR=48, PDR=68. TC concentration did not differ significantly when NPDR and PDR patients were compared with CDNR patients and normal subjects. HDL-C of CDNR, NPDR and PDR patients differed significantly from normal subjects ($P < 0.001$). Mean values also differed among the three groups. LDL-C values were significantly greater in NPDR and PDR patients as compared to CDNR and normal subjects ($P < 0.001$). Serum TG concentrations were significantly greater in all the three diabetic groups, ie CDNR, NPDR, PDR patients as compared to normal subjects ($P < 0.002$). Mean value, medians and ranges of TC, HDL-C, LDL-C and TG of all the subjects group-wise are given in Table 1. Systolic blood pressure was found significantly higher in both NPDR and PDR patients than CDNR and normal subjects ($P < 0.001$). Maximum median value was 140 mmHg while the range was 110-160 mmHg. Diastolic blood pressure was found higher in CDNR and NPDR patients vs normal subjects ($P < 0.05$) with median value being 90 mmHg in all diabetic subjects (Table 2).

Table 1: Lipid profile of normal subjects, control diabetic, diabetic non-proliferative and diabetic proliferative retinopathic male patients

Lipid profile	Mean ± SD
Cholesterol	
NS	169.94 ± 26.33
CDNR	158.86 ± 28.92
NPDR	166.59 ± 33.24
PDR	173.94 ± 37.22
HDL	
NS	53.35 ± 10.17
CDNR	29.46 ± 6.33*
NPDR	33.04 ± 10.54*
PDR	40.95 ± 10.214*c,b
LDL	
NS	75.94 ± 17.85
CDNR	71.33 ± 44.76*
NPDR	99.59 ± 35.50*
PDR	95.62 ± 35.00*
TG	
NS	121.70 ± 48.94
CDNR	197.93 ± 59.83*
NPDR	184.80 ± 84.52*
PDR	205.28 ± 107.92*

TC ns; HDL * $P < 0.05$ vs normal, c vs a, b vs a; LDL * $P < 0.05$ vs normal, a vs b and c; TG * $P < 0.05$ vs normal

NS= normal subjects, CDNR= subjects with no DR, NPDR=non-proliferative DR, PDR= proliferative DR

Table 2: Blood Pressure (systolic and diastolic) of normal subjects, control diabetic, diabetic non-proliferative and diabetic proliferative retinopathic male patients

Blood pressure	Mean ± SD	No. with %ages
Systolic BP		
NS	124.706 ± 5.14	18(12%)
CDNR	128.333 ± 6.45	16(10.6%)
NPDR	135.532 ± 10.38*	48(32%)
PDR	137.910 ± 15.02*c	68(45.3%)
Diastolic BP		
Normal	84.11 ± 5.073	18(12%)
CDNR	86.33 ± 4.806*	16(10.6%)
NPDR	87.87 ± 4.137*	48(32%)
DPDR	86.86 ± 4.674	68(45.3%)

Systolic * P < 0.05 vs normal, c vs a ; Diastolic *P < 0.039 vs Normal

DISCUSSION

Diabetic Retinopathy is a major cause of blindness among the working age group[9,10]. Dyslipidemia and hypertension are two important risk factors among many that are responsible for development and progression of DR[5,6]. Intensive correction of these has been effectively shown by the ACCORD (The Action to Control Cardiovascular Risk in Diabetes) and The Fenofibrate Intervention and Event Lowering in Diabetes (FIELD) studies to slow the progression of DR[7,11]. In our study we have tried to draw a comparison line for lipid and blood pressure profiles between the two stages of DR, i.e., NPDR and DPR. With the hope of making the findings more elaborate, we selected male patients in the light of some recent studies which have reported that male gender is specifically more related to the presence and severity of DR[12,13].

Overall, our results show that except TC all the fractions of lipids are significantly related to the development and progression of retinopathy in this sample of male type 2 diabetic patients. This is in agreement with one of the major landmark studies, the Wisconsin Epidemiologic Study of Diabetic Retinopathy (WESDR), in which higher total serum cholesterol was associated with higher prevalence of retinal hard exudates in type 1 diabetic patients, but not in those with type 2 diabetics[14]. In the Early Treatment Diabetic Retinopathy Study (ETDRS), higher levels of serum lipids (triglycerides, low-density lipoproteins, and very-low-density lipoproteins) were associated with increased risk of developing macular hard exudates and visual acuity impairment[15]. Our study has demonstrated significantly higher serum LDL levels (P<0.001) in both type of retinopathic patients than CDNR and NS subjects although PDR has lower mean values than NPDR subjects. This could be due to relatively higher rate of lipid lowering agents used by these patients. In a prospective study to investigate the influence of serum lipids on the visual outcome of patients after central laser photocoagulation, Kremser et al found that patients with normal TC, LDL, HDL and TG levels tended to have better results than those with abnormal lipid levels. They concluded that serum lipid fractions influence both the course of diabetic macular oedema as well as the success of laser photocoagulation[16]. Association of retinopathy progression with dyslipidemia was also suggested in a study conducted for the response of lipid lowering agents on the outcomes of retinopathy which showed that successful anti-lipid therapy can reduce vision along with improvement in the pathologic process of retinopathy[17].

Our current study has shown a positive relationship between serum TG levels and the retinopathy progression as evidenced by their significantly raised levels in CDNR, NPDR and PDR patients. In contrast, an inverse relationship between fasting triglycerides and diabetic retinopathy was found in one study in which retinopathy association was detected with hypertriglyceridemia only in microalbuminuric patients[18]. As we did not consider microalbuminuria or other measure of nephropathy in our patients, therefore we do not know about this effect in the current study. Longo-Mbenza et al showed a significant relationship between shorter DM duration and low HDL-C with DR which may explain the association observed between low HDL-C and DR[19]. In our study too, this important lipid fraction significantly differs from the normal subjects with lower values in retinopathic subjects.

Hypertension is an important risk factor for the onset and progression of DR, and in most studies it is an independent risk factor[20,21]. In The United Kingdom Prospective Diabetes Study 34 (UKPDS 34) investigators demonstrated that blood pressure control is associated with a reduction in DR incidence; the relative risk for DR being 1.5 concerning systolic BP between 125-139 mmHg and 2.8 for systolic BP higher than 140 mm Hg[7,21]. Many studies have used to target only systolic BP for its effect on retinopathy. In UKPDS 50, systolic BP was shown significantly associated with DR incidence in the upper ranges but not with DR progression[21]. In our study both systolic and diastolic BP are significantly higher in retinopathic diabetic patients as compared to normal subjects indicating positive association, although diastolic BP seems to be having somewhat borderline situation.

One of the main limitations of our study includes indifference to the glycemic levels of the study subjects.

CONCLUSION

Significantly higher serum TG, LDL, lower serum HDL levels and higher systolic and diastolic BP values in the male retinopathic patients with type 2 DM as compared to normal subjects are found in this study. Making these lipid and BP fractions target for correction during overall clinical management of diabetic patients may give additional benefit retarding the development and progression of retinopathy.

REFERENCES

1. Alberti KG, Zimmet P for the WHO Consultation. Definition, diagnosis and classification of diabetes mellitus and its complications. Diabetic Medicine 1998;15: 539-53.
2. Bloomgarden ZT. Treatment of Type 2 Diabetes: The American Association of Clinical Endocrinologists Meeting, May 2002. Diabetes Care 2002; 25: 1644-49.
3. Krakoff J, Lindsay RS, Looker HC, Nelson RG, Hanson RL, Knowler WC. Incidence of Retinopathy and Nephropathy in Youth-Onset Compared With Adult-Onset Type 2 Diabetes. Diabetes Care 2003; 26: 76-81.
4. Pizzarello L, Abiose A, Ffytche T, Durksen R, Thulasiraj R, Taylor H. Vision 2020: The Right to Sight: a global initiative to eliminate avoidable blindness. Arch Ophthalmol 2004; 122: 615-20.
5. Fong DS, Aiello L, Gardner TW. Diabetic Retinopathy. Diabetic Care 2003; 26: S99-S102-104.
6. Siddiqui SJ, Pechuho MA, Shah SIA, Sheikh F, Sheikh AQ. Risk factors associated with diabetic Retinopathy. Ophthalmology 2009; 15(4): 69-70.
7. The ACCORD Study Group and ACCORD Eye Study Group. Effects of Medical Therapies on Retinopathy Progression in Type 2 Diabetes. N Engl J Med 2010; 363: 233-44.
8. UK Prospective Diabetes Study Group. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. BMJ 1998; 317 (7160): 703-13.
9. Congdon NG, Friedman DS, Lietman T. Important causes of visual impairment in the world today. JAMA 2003; 290: 2057-60.
10. Eye Diseases Prevalence Research Group. Causes and prevalence of visual impairment among adults in the United States. Arch Ophthalmol 2004; 122: 477-85.
11. Keech AC, Mitchell P, Summanen PA. Effect of fenofibrate on the need for laser treatment for diabetic retinopathy (FIELD study): Lancet 2007; 370: 1687-97.
12. Chatziralli IP, Sergentanis TN, Keryttopoulos P, Vatkalis N, Agorastos A, Papazisis L. Risk factors associated with diabetic retinopathy in patients with diabetes mellitus type 2. BMC Research Notes 2010, 3: 153.
13. Rani PK, Raman R, Chandrakantan A, Pal SS, Perumal GM, Sharma T: Risk factors for diabetic retinopathy in self-reported rural population with diabetes. J Postgrad Med 2009, 55: 92-96.
14. Klein BE, Moss SE, Klein R, Surawicz TS: The Wisconsin Epidemiologic Study of Diabetic Retinopathy (WESDR) XIII. Relationship of serum cholesterol to retinopathy and hard exudates. Ophthalmology 1991; 98: 1261-65.
15. Chew EY, Klein ML, Ferris FL 3rd. Association of elevated serum lipid levels with retinal hard exudate in diabetic retinopathy. Early Treatment Diabetic Retinopathy Study (ETDRS) Report 22. Arch Ophthalmol 1996; 114:1079-84.
16. Kremser BG, Falk M, Keiselbach GF. Influence of serum lipid fractions on the course of diabetic macular oedema after photocoagulation. Ophthal-mologica 1995; 209: 60-63.
17. Sen K, Misra A, Kumar A, Pandey RM. Simvastatin retards progression of retinopathy in diabetic patients with hypercholesterolemia. Diabetes research and clinical practice 2002; 56 (1): 1-11.
18. Olivarius N, Nielsen NV, Andreasen AH. Diabetic retinopathy in newly diagnosed middle-aged and elderly diabetic patients. Graefes Arch Clin Exp Ophthalmol 2001; 239(9): 664-72.
19. Longo-MB, Muaka MM, Mbenza G, Mbungu FS, Mabwa ML, Nzuzi BV, et al. Risk factors of poor control of HBA1c and diabetic retinopathy: Paradox with insulin therapy and high values of HDL in African diabetic patients. Int J Diabetes & Metabolism 2008; 16: 69-78.
20. UK Prospective Diabetes Study Group. Effect of intensive blood-glucose control with metformin on complications in overweight patients with type 2 diabetes (UKPDS 34). Lancet 1998, 352: 854-65.
21. Stratton IM, Kohner EM, Aldington SJ, Turner RC, Holmann RR, Manley SE, et al. Risk factors for incidence and progression of retinopathy in type II diabetes over 6 years from diagnosis (UKPDS 50). Diabetologia 2001; 44: 156-63.