FREQUENCY OF DYSLIPIDAEMIA IN TYPE 2 DIABETES MELLITUS IN PATIENTS OF HAZARA DIVISION

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Background: Diabetes mellitus increases the risk of atherosclerotic vascular disease because of associated dyslipidaemia. Many studies advocate aggressive management of lipid disorders in Type 2 Diabetes to decrease these complications. This study was carried out to know the frequency of dyslipidaemia in our patients and also to determine that whether patients with good glycaemic control (HbA1c≤8%) are having better lipid profile than poorly controlled group. Cross-sectional survey was conducted in Medical OPD and Medical 'B' Ward of Ayub Teaching Hospital, Abbottabad between March 2006 to March 2007. **Methods:** Patients with Type 2 Diabetes mellitus coming to Medical OPD as well as among those admitted in Medical 'B' Ward fulfilling the inclusion criteria were selected. Blood was taken in the fasting state for lipid profile, fasting blood glucose and glycosylated haemoglobin determination. **Results:** Among 100 patients with Type 2 Diabetes, 78 were found to have hypertriglyceridaemia, while, 92 had LDL-Cholesterol in borderline cardiovascular risk status. Out of 78 patients with hypertriglyceridaemia 46 (59%) were poorly controlled diabetics (HbA1c>8%) emphasizing the importance of good glycaemic control. However none of our patients had a low HDL-Cholesterol as found in some other studies. **Conclusion:** Hypertriglyceridaemia along with impaired LDL-Cholesterol is present in majority of our patients. Good glycaemic control does affect the lipid profile in Type 2 Diabetes mellitus. However to provide the benefits of lipid lowering therapy to our patients, as confirmed in many studies, we need more awareness and placebo controlled double blind studies.
Keywords; Dyslipidaemia, Glycosylated haemoglobin, Type 2 Diabetes mellitus

INTRODUCTION

Type 2 Diabetes Mellitus is a heterogeneous condition characterized by the presence of both impaired insulin secretion and insulin resistance.[1] It has, unfortunately, reached epidemic proportions now-a-days.[2] Diabetes care is complex and requires that many issues, beyond glycaemic control, be addressed.[3] It is a chronic disease and usually irreversible.[4] Therefore the patients with diabetes often have to consult health-care providers for the remainder of their lives. They are prone to certain complications and evidence emerged in the 1990s supporting the benefits of glycaemic control as well as control of blood pressure and lipid levels in the prevention or delay in onset & severity of diabetes complications.[5–7] Diabetes mellitus is a common secondary cause of hyperlipidaemia, particularly, if glycaemic control is poor[8–11], which in-turn is an important risk factor for atherosclerosis and coronary heart disease. While the management of hyperglycaemia, the hallmark metabolic abnormality associated with diabetes, has historically had centre stage in the treatment of diabetes, therapies directed at other coincident features such asdyslipidaemia, hypertension, hypercoagulability, obesity and insulin resistance have also been a major focus of research and therapy.[3] Intensive treatment strategies have been demonstrated to reduce complications in diabetics.[5–7,12]

Patients with diabetes can have a reasonably normal life-style if they are well educated and motivated concerning the disease. However, most of our patients belong to low or middle socioeconomic class and are less educated. As a result, dietary control and compliance with treatment is not up to standards. This study was conducted to see whether they are having dyslipidaemia consistent with other studies and at increased risk of coronary artery disease & other diabetes related complications.[8–10,13,14,24,25] The study also aims to compare lipid levels of patients with good glycaemic control to those with poor glycaemic status.

MATERIALS AND METHODS

Type 2 Diabetic patients coming to Medical OPD as well as those admitted in Medical 'B' Ward during March, 2006 to March, 2007 fulfilling the inclusion criteria were selected. Hundred patients were enrolled in the study who were≥40 years and no clinical/electrocardiographic evidence of coronary artery disease and not suffering from other causes of secondary hyperlipidaemia. Incidentally, 50% of the patients were females. Blood samples were taken from the patients in the fasting state for lipid estimation. In addition, patients' FBG (fasting blood glucose) and HbA1c (Glycosylated haemoglobin) were also estimated to know about the glycaemic control of patients. Any previous records of blood sugars with the patients were also noted. ECG (electrocardiogram) of all patients was taken and routine investigations done. Lipid levels of patients were compared against the recommendations for adults with diabetes.[15,16] In addition a comparison

was also made of the lipid levels in patients with good control of diabetes (HbA1c≤8%)[17] with those having poor glycaemic control (HbA1c>8%).The data was collected on a questionnaire and entered into computer using SPSS-10. Continuous variables were described in terms of Mean±SD and categorical variables in terms of frequencies and percentages.

RESULTS

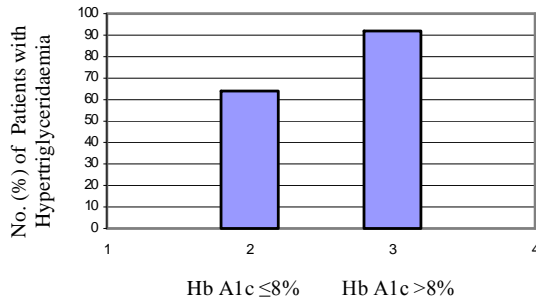The results of our study are given in Table-1 to 5 and Figure-1.

Figure-1: Percentage of patients with hyper-triglyceridaemia according to their glycaemic status

Table-1: Lipid levels of Patients

Lipids	Recommended level for adults with Diabetes	of patients as per recommendations
LDL-Cholesterol	<2.6 mmol/l (<100 mg/dl)	None
Triglycerides	<1.7 mmol/l (<150 mg/dl)	22
HDL-Cholesterol	>1.0 mmol/l (>40 mg/dl)	100

Table-2: Cardiovascular risk status of Patients according to their lipid levels

Lipids	Plasma Concentration	Cardiovascular Risk Status	No. of Patients
LDL-Cholesterol	>3.4 mmol/l	High	6
	2.6–3.4 mmol/l	Borderline	94
	<2.6 mmol/l	Low	0
Triglycerides	>4.5 mmol/l	High	0
	2.2–4.5 mmol/l	Borderline	16
	<2.2 mmol/l	Low	84
HDL-Cholesterol	<0.9 mmol/l	High	0
	1.2–0.9 mmol/l	Borderline	10
	>1.2 mmol/l	Low	90

Table-3: Glycaemic status of Patients

HbA1c	Glycaemic Status	No. Of Patients
≤ 8%*	Good	50
> 8%	Poor	50

*Referenced to a non-diabetic range of 4.4-6.7 using Bio-Systems based assay

Table-4: Lipid levels of patients according to their glycaemic status

HbA1c	Lipids	Recommended level for adults with Diabetes	No. of Patients
≤ 8%	LDL-Cholesterol	<2.6 mmol/l	0
	Triglycerides	<1.7 mmol/l	18
	HDL-Cholesterol	>1.0 mmol/l	50
> 8%	LDL-Cholesterol	<2.6 mmol/l	0
	Triglycerides	<1.7 mmol/l	4
	HDL-Cholesterol	>1.0 mmol/l	50

Table-5: Cardiovascular risk status according to the lipid levels & glycaemic status

HbA1c	Lipids	Plasma Concentration	Cardiovascular Risk Status	No. of Patients
≤8%	LDL-Cholesterol	>3.4 mmol/l	High	0
		2.6–3.4 mmol/l	Borderline	50
		<2.6 mmol/l	Low	0
	Triglycerides	>4.5 mmol/l	High	0
		2.2–4.5 mmol/l	Borderline	0
		<2.2 mmol/l	Low	50
	HDL-Cholesterol	<0.9 mmol/l	High	0
		1.2–0.9 mmol/l	Borderline	4
		>1.2 mmol/l	Low	46
>8%	LDL-Cholesterol	>3.4 mmol/l	High	6
		2.6–3.4 mmol/l	Borderline	44
		<2.6 mmol/l	Low	0
	Triglycerides	>4.5 mmol/l	High	0
		2.2–4.5 mmol/l	Borderline	16
		<2.2 mmol/l	Low	34
	HDL-Cholesterol	<0.9 mmol/l	High	0
		1.2–0.9 mmol/l	Borderline	6
		>1.2 mmol/l	Low	44

DISCUSSION

Diabetes mellitus increases the risk for atherosclerotic vascular disease. The risk is greatest in people who have other known risk factors, such as, dyslipidaemia, hypertension, smoking and obesity. There is a twofold to fourfold excess risk of coronary artery disease in type 2 diabetes mellitus compared with non-diabetic patients.[18,19] Indeed, 75–80% of adult diabetic patients die of coronary artery disease, cerebrovascular disease, peripheral vascular disease or a combination of these conditions.[20,21] Patients with type 2 diabetes can have many lipid abnormalities, including hyper-chylomicronaemia, elevated levels of very low-density lipoprotein cholesterol (VLDL-C),low-density lipoprotein cholesterol (LDL-C) and triglycerides; and low levels of high-density lipoprotein cholesterol (HDL-C).[22] Lipid abnormalities may be the result of the unbalanced metabolic state of diabetes (i.e., hyperglycaemia and insulin resistance) and improved control of hyperglycaemia does moderate diabetes-associated dyslipidaemia.[23,24] In type 2 diabetes the major disturbances in lipoprotein metabolism are reflected by an increase in plasma triglyceride and a low HDL-Cholesterol with normal or near normal LDL-Cholesterol levels. However in diabetics this LDL fraction contains a greater proportion of small, dense LDL particles which are believed to be more atherogenic.[25,26] In our patients none was found to have LDL-Cholesterol meeting the recommended level while Triglycerides were as per recommendations in only 22% of patients (Table-1).

HDL-Cholesterol level was, however, meeting the recommendations in all of our patients (Table-1). In patients with good glycaemic control (HbA1c≤8%) 64% of patients had triglycerides above the recommended level compared with 92% of patients with poor

glycaemic control (HbA1c>8%) (Table-4 and 6). Moreover as far as cardiovascular risk status is concerned, all the patients with HbA1c≤8% were in low risk category while among patients with HbA1c>8%, 16 (32%) were having borderline cardiovascular risk status (Table-5). LDL-Cholesterol levels did not meet the recommendations in both groups of patients while HDL-Cholesterol was above required levels in all patients (Table-4).

Longitudinal epidemiology has pointed to the importance of raised plasma triglycerides and low HDL-Cholesterol as a risk factor for coronary disease in diabetic subjects[24,26] and there is supportive evidence for aggressive management of lipid disorders in type 2 diabetes.[27–30] Majority of our patients have hypertriglyceridaemia, i.e., 78% of patients (Table-1) and LDL-Cholesterol in borderline cardiovascular status, i.e., 94% of patients (Table-2) which is consistent with other studies.[9,10,24,25,29] However none of our patients had a low HDL-Cholesterol compared with other studies[13,14,24], which, is also a modifiable risk factor for coronary vascular disease. Although evidence has been provided for new treatment guidelines regarding dyslipidaemia in diabetes[15,16] and one local study has shown that one out of every three patients with Acute Myocardial Infarction was found to have Diabetes Mellitus, emphasizing its deleterious effects on the body.[31] However to apply these guidelines to our patients we need more controlled studies. As far as glycaemic status and lipid disorders are concerned hypertriglyceridaemia was found in 64% of patients with good glycaemic control compared with 92% of patients in poorly controlled group, i.e., $p<0.05$ (Table-4 and Figure-1). This is statistically quite significant and needs to be evaluated on a larger scale as there are studies showing that improved control of hyperglycaemia do modify diabetes associated dyslipidaemia.[23,24] LDL-Cholesterol and HDL-Cholesterol,on the other hand, revealed the same pattern in both groups of patients (Table-4).

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REFERENCES

1. Davidson MB, Schriger DL, Peters AL. An alternative approach to the diagnosis of diabetes with a review of the literature. Diabetes Care 1995;18:1065–71.
2. Expert Committee on the Diagnosis and Classification of Diabetes Mellitus: Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care,2001;24(Suppl 1):S5–S20.
3. American Diabetes Association. Position Statement; Standards of Medical Care in Diabetes-2007.Diabetes Care 2007;30:S4–S41.
4. Vinicor F. When is diabetes? JAMA,1999;281:1222–4.
5. UK Prospective diabetes study (UKPDS) Group. Intensive blood glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with Type 2 Diabetes(UKPDS 33). Lancet1998;352:837–53.
6. UK Prospective Diabetes Study (UKPDS) 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.
7. Stratton IM, Adler AI, Neil HA, Matthews DR, Manley SE, Cull CA, et al. Association of glycaemia with macrovascular and microvascular complications of Type 2 Diabetes (UKPDS 35);Prospective Observational Study. BMJ,2000;321:405–12.
8. Howard BV. Insulin resistance and lipid metabolism. Am J Cardiol,1999;84: 28j–32j.
9. Marwat MA, Wazir ZM. Hypertriglyceridaemia in Diabetes Mellitus. J Ayub Med Coll, Abbottabad 2000;12(4):24–5.
10. Naheed T, Khan A, Masood G. Dyslipidaemias in Type 2 Diabetes Mellitus Patients in a Teaching Hospital of Lahore,Pakistan. Pak J Med Sci 2003;19(4):283–86.
11. Nathen DM, Buse JB, Davidson MB, Heine RJ, Holman RR, Sherwin R et al. Management of Hyperglycaemia in Type 2 Diabetes:A Consensus Algorithm for the Initiation and Adjustment of Therapy; A consensus statement from the American Diabetes Association and the European Association for the Study of Diabetes. Diabetes Care, 2006;29:1963–72.
12. Ohkubo Y, Kishikawa H, Araki E, Takao M, Isami S, Motoyoshi S et al. Intensive insulin therapy prevents the progression of diabetic microvascular complications in Japanese patients with NIDDM; A randomized prospective 6-year study. Diabetes Res Clin Pract 1995;28:103–17.
13. Rukhsana AS, Ahmad S, Hussain S, Irtiaz Rizvi SM, Jamal Ara. Frequency of Lipid abnormalities in Essential Hypertension. J Surg Pak 2002;7(4):2–4.
14. Khan JA, Khan SP, Ahmed Z, Shah SH, Khaliq MA. Level of hyper-cholesterolemia in patients admitted for heart diseases; a pilot study. Pak J Med Res 2001;40(1):18–9.
15. American Diabetes Association. Management of dyslipidaemia in adults with diabetes. Diabetes Care 1999;22 (suppl 1):S56–9.
16. Watts GF. Coronary disease, dyslipidaemia and clinical trials in Type 2 Diabetes Mellitus; Review Article Prac Diab Intern, 2000;17(2):54–9.
17. Kilpatrick ES. Glycated haemoglobin in the year 2000. J Clin Pathol, 2000;53:335–39.
18. Pyorala K, Laakso S, Uusitupa M. Diabetes and atherosclerosis: an epidemiologic view. Diabetes Metab Rev 1987;3(2):463–524.
19. Haffner SM, Lehto S, Ronnemaa T, Pyorala K, Laakso M. Mortality from coronary heart disease in subjects with type 2 diabetes and in nondiabetic subjects with and without prior myocardial infarction. N Engl J Med 1998;339:229–34.
20. Laakso M. Dyslipidaemia, morbidity and mortality in non-insulin dependant diabetes mellitus. Lipoproteins and coronary heart disease in non-insulin dependant diabetes mellitus. J Diabetes Complications, 1997;11(2):137–41.
21. Haffner SM. Management of dyslipidaemia in adults with diabetes. Diabetes Care,1998;21(1):160–78.
22. American Diabetes Association. Management of dyslipidaemia in adults with diabetes. Diabetes Care 1998;21(1):179–82.
23. Marcus AO. Lipid disorders in patients with type 2 diabetes; Meeting the challenges of early, aggressive treatment. Postgrad Med, 2001;110(1):111–23.
24. Lehto S, Ronneman T, Haffner SM, Pyorala K, Kallio V, Laakso M. Dyslipidaemia and hyperglycaemia predict coronary heart disease events in middle-aged patients with NIDDM. Diabetes 1997;46:1254–359.
25. Syvanne M,Taskinen MR. Lipids and lipoproteins as coronary risk factors in non-insulin dependant diabetes mellitus. Lancet 1997;350(suppl 1):20–3.
26. Hokanson JE, Austin MA. Plasma triglyceride level as a risk factor for cardiovascular disease independent of high-density

lipoprotein cholesterol: a meta-analysis of population-based prospective studies. J Cardiovasc Risk 1996;3:213–9.

27. Pyorala K, Pedersen TR, Kjekshus J, Faegeman O, Olsson AG, Thorgeirsson G. The Scandinavion Simvastatin Survival Study(4S). Cholesterol lowering with simvastatin improves prognosis of diabetic patients with coronary heart disease: a sub-group analysis of the Scandinavian Simvastatin Survival Study(4S). Diabetes Care,1997;20:614–20.

28. Goldberg RB, Mellies MJ, Sacks FM, Moye LA, Howard BV, Howard WJ, *et al*. Cardiovascular events and their reduction with pravastatin in diabetic and glucose intolerant myocardial infarction survivors with average cholesterol levels. Circulation, 1998;98:2513–9.

29. Koskinen P, Manttari M, Manninen V, Huttunen JK, Heinonen OP, Frick MH. Coronary heart disease incidence in NIDDM patients in the Helsinki Heart Study. Diabetes Care, 1992;15:820–5.

30. Elkeles RS, Diamond JR, Poulter C, Dhanjel S, Nicolaides AN, Mahmood S, *et al*. The SENDCAP Study Group. Cardiovascular outcomes in Type 2 diabetes. A double-blind placebo-controlled study of bezafibrate: the St Mary's, Ealing, Northwick Park Diabetes Cardiovascular Disease Prevention(SENDCAP) Study. Diabetes Care, 1998;21:641–8.

31. Shaikh BA, Shaikh WM, Solangi GA, Sangi SA, Abro HA, Shaikh AM, *et al*. Diabetes mellitus(diagnosed and undiagnosed)in Acute Myocardial Infarction. Medical Channel 2006;12(2):36–9.

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