International Journal of Advances in Medicine
Kolhar U et al. Int J Adv Med. 2017 Dec;4(6):1513-1516
http://www.ijmedicine.com
pISSN 2349-3925 | eISSN 2349-3933
DOI: http://dx.doi.org/10.18203/2349-3933.ijam20174639

Original Research Article

Study of serum lipid profile in type 2 diabetes mellitus patients and its association with diabetic nephropathy

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Received: 14 September 2017
Accepted: 19 September 2017

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ABSTRACT

Background: Dyslipidaemia is highly prevalent in type 2 Diabetes mellitus patients. The role of dyslipidaemia in macrovascular complications of Diabetes have been extensively studied but its role in microvascular complications namely nephropathy is still unclear. The present study was undertaken to study the prevalence and pattern of dyslipidaemia and its association with Diabetic nephropathy (DN) in patients with type 2 DM.
Methods: 100 patients with type 2 DM attending OPD or admitted, over a period of 1 year were studied. Detailed history was taken and clinical examination was done. Serum lipid profile was studied in all patients and its association with DN was assessed.
Results: The prevalence of dyslipidaemia in DM patients in our study was 90% and there was no statistically significant difference in the prevalence among males and females. Poorly controlled diabetics had high prevalence of dyslipidaemia as compared to well controlled diabetics. The prevalence of Diabetic nephropathy in our study was 41%. There was significant association of DN with high Total Cholesterol, high Low-density lipoprotein (LDL-C) and high Triglycerides. There was no significant association of DN with High density lipoprotein (HDL-C).
Conclusions: Present study highlights the magnitude of dyslipidaemia in type2 DM patients and that there is a significant association of DN with lipid parameters. Hence patients should be managed with life style modifications with or without lipid lowering agents to achieve target lipid values along with adequate glycemic control to prevent or delay the appearance and progression of DN.

Keywords: Diabetes mellitus, Diabetic nephropathy, Lipid profile

INTRODUCTION

The prevalence of diabetes mellitus is growing rapidly worldwide and is reaching epidemic proportions. The global prevalence of diabetes among adults is estimated to be 6.4%, affecting 285 million people in 2010 and is expected to increase to 7.7% affecting 439 million people by 2030.[1]

Lipid abnormalities associated with diabetes are termed as dyslipidaemia rather than hyperlipidaemia because there may be changes in both quantity and quality of the lipoproteins. Diabetes mellitus (DM) is a common secondary cause of hyperlipidaemia, particularly, if glycaemic control is poor, which in-turn is an important risk factor for atherosclerosis and coronary heart disease.

The exponential rise in the global prevalence of diabetes almost certainly can be associated with an inevitable and parallel increase in the long-term complications that associate with diabetes. Diabetes threatens to reduce life expectancy and increase morbidity and mortality as a

result of its complications which are classified as macrovascular and microvascular. Diabetic nephropathy is the leading cause of end stage renal disease and diabetes related morbidity and mortality. It is also one of the most significant long-term complications in terms of morbidity and mortality for individual patients with diabetes. Diabetic nephropathy is the leading cause of end-stage renal disease (ESRD) worldwide, and it is estimated that 20% of type 2 diabetic patients reach ESRD during their lifetime.[2]

The role of dyslipidaemia in macrovascular complications is well established. But its role in microvascular complications namely Diabetic nephropathy has not been studied extensively. The present study aimed to study serum lipid profile in type 2 diabetes mellitus patients and association of lipid profile with diabetic nephropathy.

METHODS

This study was a cross sectional hospital based study. 100 randomly selected patients with type 2 diabetes mellitus attending to the outpatient department or admitted in the Department of General Medicine, VIMS and RC, Bangalore, who were between 40-80 yrs. of age irrespective of duration of diabetes were included in the study. Patients with Hypertension, patients with BMI> 30 kg/m2, patients on lipid lowering agents (statins, fibrates, etc.), and patients on treatment with medications which alter lipid profile were excluded from the study.

All cases were studied with reference to history, physical examination and necessary investigations. Fasting and post prandial blood sugar, fasting lipid profile was done. Low density lipoprotein cholesterol (LDL-C) was calculated by Friedewald's formula. Glycosylated haemoglobin (HbA1c) was analysed by high pressure liquid chromatography method. Patients having one or more parameters (TG, TC, HDL-C or LDL-C) outside the targets recommended by American Diabetes Association (ADA) were considered to have dyslipidaemia which includes TG≥150 mg/dl, LDL≥ 100mg/dl, HDL≤40 mg/dl in males and ≤50 mg/dl in females and TC> 200 mg/dl. 24 hr urine protein, spot urine micro albumin levels and spot urine albumin creatinine ratio were estimated. Serum creatinine levels were done and GFR calculated using Crockroft-Gault equation in all patients.

Statistical analysis

In our study, various descriptive and inferential statistics have been calculated. As for the descriptive statistics are concerned, quantitative data have been expressed in terms of mean whereas qualitative data as frequency and percentages. The non-numeric data have also been graphically represented by bar diagram and pie charts. Chi-square test has been applied for the comparison of various prevalence in different groups. The p-value of<0.05 was considered statistically significant. The data have been analysed using statistical package version SPSS-20.

RESULTS

During our study we randomly selected 100 Diabetes mellitus patients visiting OPD or admitted in the department of Medicine at our institution. Out of 100 DM patients, 56 were Males and 44 were Females. The Mean age of patients in our study was 54.9 + 7.6 years. Mean duration of diabetes mellitus was 5.13 +4.5 years. Mean HbA1C was 9.03 +2.1. Mean FBS was 169.6 + 54.7 mg/dl and mean PPBS was 278.9 + 91.3 mg/dl.

The prevalence of dyslipidaemia in our study was 90%. 51 out of 56 Male patients had dyslipidaemia, i.e. the prevalence of dyslipidaemia in males was 91% whereas 39 out of 44 female patients had dyslipidaemia i.e. the prevalence of dyslipidaemia in female DM patients was 88.6%.

Most common pattern of lipid abnormality in our study was combined dyslipidaemia. Combined dyslipidaemia of High TG and low HDL-C was the most common pattern in both males and females. 2nd most common pattern was isolated dyslipidaemia i.e. Low HDL-C in both males and females. Out of 100 DM patients, 12 had well controlled diabetes (HbA1C < 7) and 88 patients had poorly controlled diabetes (HbA1C >7). There was a significant association between prevalence of dyslipidaemia and glycaemic control. Dyslipidaemia is more prevalent in patients with uncontrolled diabetes

In our study 41 out of 100 Diabetes patients had Diabetic Nephropathy. Out of 41 DN patients 25 had micro albuminuria and 16 had macro albuminuria. Out of 100 patients, 48 patients had GFR > 90 ml/min/1.73 m2, 33 had GFR of 60-90 ml/min/1.73m^2 and 19 patients had GFR < 60 ml/min/1.73 m^2.

Table 1: Mean values of lipid parameters in our study.

Lipid parameter	Mean ±SD
Total cholesterol	175.2 ± 47.4
HDL-C	37.4 ±10.6
LDL-C	105.8±35
Triglycerides	181.7 ±103.5

Table 2: Association of dyslipidaemia with HBA1C.

	Well controlled diabetes (Hba1c < 7)	Poorly controlled diabetes (Hba1c > 7)	P value
Dyslipidaemia	4 (33.3 %)	86 (97.7 %)	< 0.001
Normal lipid profile	8 (66.6%)	2 (2.3%)	< 0.001

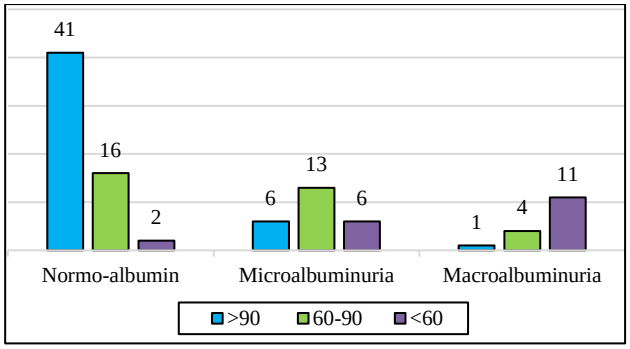

Figure 1: Distribution of patients according to eGFR at various stages of ACR.

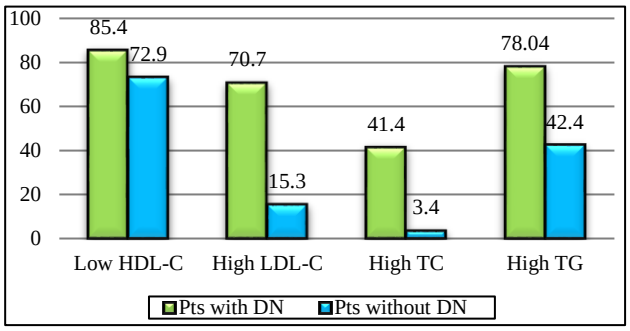

Figure 2: Comparison of lipid parameters in patients with DN and without DN.

We found highly significant association of DN with High LDL-C, High TC and High TG. There was no significant association of DN with Low HDL-C (P > 0.05).

DISCUSSION

The prevalence of dyslipidaemia in Diabetes Mellitus patients in our study was 90%. This finding was similar to studies done by Jayarama N, et al.[3] Hetal Pandya, et al. and Daniel Nii Aryee Tagoe, et al which showed prevalence of 91%, 85%, and 93% respectively.[4,5] There was no statistically significant difference in the prevalence of dyslipidaemia among males and females.

Most common pattern of dyslipidaemia in both males and females in our study was combined dyslipidaemia with low HDL-C + high triglycerides (TG) affecting 26% females and 29% male patients. In a study done by Jayarama N, et al.[3] Most common pattern of dyslipidaemia in both males (44.2%) and females (42.97%) was combined dyslipidaemia. In males combined dyslipidaemia with high TG and low HDL (20.43%) was most common whereas in females combined dyslipidaemia with high LDL and low HDL (21.68%) was most common.

2nd most Common pattern of dyslipidaemia in our study was isolated Low HDL-C affecting 23 % female patients and 25 % of male patients. In a study done by Jayarama N, et al.[3] Second most common pattern of dyslipidaemia was isolated low HDL level affecting 17.09% males and 12.85% females. These results were in comparison to our study.

In our study poorly, controlled diabetes patients (HbA1C > 7) had 97.7 % prevalence of dyslipidaemia as compared to 33.3 % prevalence in well controlled diabetes patients (HbA1C <7). Similar results were obtained in study done by Hetal Pandya et al, Ram Vinod Mahato et al and Prashant Tayde et al.[4,6,7]

In our study prevalence of Diabetic Nephropathy was 41 %, micro albuminuria was present in 25 % patients and 16% had macro albuminuria. Similar results were obtained in studies done by Mohammed Ahmed Bamashmoos Krairittichai U, et al, Kanakamani J, et al.[8-10]

Out of 59 patients with normal AER, 30.5 % patients had GFR < 90 ml/min/1.73m^2 whereas rest of the patients had GFR > 90ml/min/1.73 m^2. Study done by Macisaac RJ and Jerums G has shown that 20 % patients with type 2 diabetes have GFR <60ml/min/1.73m^2 while remaining normo albuminuric.[11] A decline in GFR is usually accompanied by a rise in albuminuria but some patients follow a non-albuminuric pathway to renal impairment. Hence both albuminuria and GFR should be assessed as markers of diabetic CKD progression.

We found highly significant association of DN with high TC, high LDL-C and high TG (P < 0.001). There was no significant association of DN with HDL-C (P = 0.138). Study done by Toth PP, et al showed similar results.[12] Study done by Alicia J.Jenkins, et al showed that TC, TG and LDL-C were associated with Albumin excretion rate (AER).[13] HDL-C was not associated with AER.

Study done by NN Jisieike-Onuigbo et al showed significant association of DN with High TC and High TG (P <0.05) and no significant association of DN with LDL-C and HDL-C (P value 0.49 and 0.26 respectively).[14] Study done by Kamran Mahmood Ahmed Aziz.[15] showed significant association of DN with High LDL-C (P <0.001). Study done by Noura Al-Jameil, et al showed similar results.[16] Study done by Katore Sarika D, et al showed significant association of DN with high TC, TG and LDL-C.[17] It also showed association of DN with high LDL-C (P<0.001). Study done by Agrawal RP, et al showed significant correlation of raised LDL-C with DN.[18]

CONCLUSION

The present study highlights the magnitude of dyslipidaemia in type 2 diabetes mellitus patients and that there is a significant association of DN with lipid parameters. Dyslipidaemia is highly prevalent in diabetics and in particular more prevalent in those with poorly controlled diabetes. Hence lipid profile should be done annually in all patients with diabetes and all patients

should be treated adequately with drugs, dietary and life style modifications to achieve target value of HbA1C < 7 and to achieve target values of TC < 200 mg/dl, TG < 150 mg/dl, LDL-C < 100 mg/dl and HDL-C > 40 mg/dl in males and > 50 mg/dl in females.

Patients with normal AER can have Low GFR. A decline in GFR is usually accompanied by a rise in albuminuria but some patients follow a Non-albuminuria pathway to renal impairment. Albuminuria and GFR have complementary roles in staging and stratifying the risk of progressive diabetic kidney disease. Hence screening for DN should include measurements of urinary ACR in a spot urine sample and measurement of serum creatinine and estimation of GFR. Since DN is associated with High TC, TG and LDL-C, patients should be managed with life style modifications with or without lipid lowering agents to achieve target lipid values along with adequate glycaemic control to prevent or delay the appearance and progression of DN.

ACKNOWLEDGEMENTS

Authors would like to acknowledge Dr. B Shashidharan HOD and Professor of Medicine, VIMS and RC for his guidance during the study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

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Cite this article as: Kolhar U, Priyanka P. Study of serum lipid profile in type 2 diabetes mellitus patients and its association with diabetic nephropathy. Int J Adv Med 2017;4:1513-6.