Original Research Article

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

Ullasini Kolhar1*, Priyanka P.2

1Department of Medicine, ESICMC and PGIMSR, Bangalore, Karnataka, India
2Department of Medicine, VIMS and RC, Bangalore, Karnataka, India

Received: 14 September 2017
Accepted: 19 September 2017

*Correspondence:
Dr. Ullasini Kolhar,
E-mail: ullasinik@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

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. 2ˢᵗ 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/1.73 m² and 19 patients had GFR < 60 ml/min/1.73 m².

| 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 |

| Dyslipidaemia | Well controlled diabetes (Hba1c < 7) | Poorly controlled diabetes (Hba1c > 7) | P value |
|---------------|------------------------------------------|------------------------------------------|---------|
| Normal lipid profile | 4 (33.3 %) | 86 (97.7 %) | < 0.001 |

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

Table 2: Association of dyslipidaemia with HBA1C.
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. Most common pattern of dyslipidaemia in both males and females 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. 

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 Bambahsnoo Krairittichai U, et al, Kanakamani J, et al. Out of 59 patients with normal AER, 30.5% patients had GFR < 90 ml/min/1.73m² whereas rest of the patients had GFR > 90ml/min/1.73 m². Study done by Macisaac RJ and Jerums G has shown that 20% patients with type 2 diabetes have GFR <60ml/min/1.73m² while remaining normo albuminuria. 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 TG, high LDL-C and high TC (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. Study done by Alicia J.Jenkins, et al showed that TC, TG and LDL-C were associated with Albumin excretion rate (AER). 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). Study done by Kamran Mahmood Ahmed Aziz showed significant association of DN with High LDL-C (P <0.001). Study done by Noura Al-Jameil, et al showed similar results. Study done by Katore Sarika D, et al showed significant association of DN with high TC, TG and LDL-C. 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.

**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

REFERENCES

1. Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. Diabetes Res Clin Pract. Elsevier; 2010;87(1):4-14.
2. Ayodele OE, Alebiosu CO, Salako BL. Diabetic nephropathy - A review of the natural history, burden, risk factors and treatment. J Natl Med Assoc. 2004;96(11):1445-54.
3. Jayarama N, Reddy M, Raj SD. Prevalence and pattern of dyslipidemia in type 2 diabetes mellitus patients in a rural tertiary care centre, southern India. Glob J Med Public Health. 2012;1:24-8.
4. Dadhania J, Trivedi A. The Prevalence and Pattern of Dyslipidemia among Type 2 Diabetic Patients at Rural Based Hospital in Gujarat, India. 2012;22(12).
5. Nii D, Tagoe A, Amo-kodieh P. Type 2 diabetes mellitus influences lipid profile of diabetic patients. 2013;4(6):88-92.
6. Vinodmahato R, Gyawali P, Raut PP, Regmi P, Singh KP, Pandeya DR, et al. Association between glycaemic control and serum lipid profile in type 2 diabetic patients: Glycated haemoglobin as a dual biomarker. Biomed Res. 2011;22(3):375-80.
7. Tayde P, Borle A, Zanwar Y, Rode M, Phatak M. Glycated hemoglobin pattern and its correlation with lipid profile in type-2 diabetic males in central india. 2013;4(4).
8. Bamashmoos MA, Ganem Y. Diabetic Nephropathy and its Risk Factors in Type 2 Diabetic Patients in Sana’a City, Yemen. 2013;9(3):147-52.
9. Krairittichai U, Potisat S, Jongsareejit A, Sattaputh C. Prevalence and risk factors of diabetic nephropathy among Thai patients with type 2 diabetes mellitus. J Med Assoc Thai. 2011;94 Suppl 2:S1-5.
10. Kanakamani J, Ammini AC, Gupta N, Dwivedi SN. Prevalence of microalbuminuria among patients with type 2 diabetes mellitus—a hospital-based study from north India. Diabetes Technol Ther. 2010;12(2):161-6.
11. Macisaac RJ, Jerums G. Diabetic kidney disease with and without albuminuria. Curr Opin Nephrol Hypertens. 2011;20(3):246-57.
12. Toth PP, Simko RJ, Pali SR, Koselleck D, Quimbo R a, Cziraky MJ. The impact of serum lipids on risk for microangiopathy in patients with type 2 diabetes mellitus. Cardiovasc Diabetol. Cardiovascular Diabetol. 2012;11(1):109.
13. Jenkins AJ, Lyons TJ, Zheng D, Otvos JD, Lackland DT, McGee D, et al. Lipoproteins in the DCCT/EDIC cohort: associations with diabetic nephropathy. Kidney Int. 2003;64(3):817-28.
14. Jisieike-Onuigbo N, Unuigbe E, Kalu O, Oguejofor C, Onuigbo P. Prevalence of dyslipidemia among adult diabetic patients with overt diabetic nephropathy in Anambra state South-East Nigeria. Niger J Clin Pract. 2011;14(2):171-5.
15. Mahmood K, Aziz A. Targeting LDL Dyslipidemia for Controlling Progression of Nephropathy in Diabetic Population: A Cross Sectional Analytical Study. 2012;6(1):7-11.
16. Al-jameil N, Khan FA, Arjumand S, Khan MF, Tabassum H. Dyslipidemia and its correlation with type 2 diabetic patients at different stages of proteinuria. 2014;25(3):327-31.
17. Katore SD, Mahajan BH, Fating PM, Muddeshwar MG, Pramanik S. Atherogenic Dyslipidemia in Diabetic Nephropathy. 2014;10(3):472-5.
18. Agrawal RP, Sharma P, Pal M, Kochar A, Kochar DK. Magnitude of dyslipedemia and its association with micro and macro vascular complications in type 2 diabetes: a hospital based study from Bikaner (Northwest India). Diabetes Res Clin Pr. 2006;73(2):211-4.

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.