

Original Research Article

Study of lipid levels in diabetes mellitus with special reference to diabetic retinopathy

Shyam Sundar C. M.*, Vaneet Jearth

Department of Medicine, Dr Rajendra Prasad Government Medical College, Tanda, Uttar Pradesh, India

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*Correspondence:

Dr. Shyam Sundar C. M.,

E-mail: shyamsundarc8790@gmail.com

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ABSTRACT

Background: Diabetic retinopathy is a very common, potentially preventable, long term, microvascular complication of diabetes mellitus and leading cause of visual disability and blindness. It is considered hallmark of generalized microangiopathy occurring in diabetic patient. The present study was designed to study the lipid levels in patients of diabetes mellitus and further analyse the data with reference to occurrence of diabetic retinopathy.

Methods: It was a case control study of 30 cases consisting patients with diabetic retinopathy and 30 controls with diabetes and no diabetic retinopathy. Fasting lipid profile, FBS, PPBS, HbA1C and BMI were measured in all subjects.

Results: 34 males (57%) and 26 (43%) females were recruited in the study. The mean duration of diabetes was 8.5 ± 5 yrs. The average HbA1C was 8.2 ± 1.3 in Diabetic Retinopathy (DR) group and 7.5 ± 0.9 in patients with no Diabetic Retinopathy (NDR). 21 (70%) patients in DR group had dyslipidaemia, whereas 13 (43.3%) patients in NDR had dyslipidaemia, average cholesterol was 188.30 ± 46.48 mg/dl in patients with DR, 182.50 ± 34.74 mg/dl in patients without DR.

Conclusions: Dyslipidaemia was found to be more common in patients having Diabetic Retinopathy than in those without DR and the association was statistically significant. Mean cholesterol levels were found to be higher in cases and mean HDL level was found to be higher in controls but the relationship was not found to be statistically significant. No association was found between other lipid fractions and retinopathy.

Keywords: Diabetes, Diabetic retinopathy, Lipid profile

INTRODUCTION

Diabetes mellitus is considered as an all organ affecting disease. Many people with type 2 diabetes have macrovascular and microvascular complications at the time of first diagnosis of diabetes.¹⁻³ Diabetic retinopathy (DR) is a vascular disorder affecting the microvasculature of the retina. It is estimated that diabetes mellitus affects 4 per cent of the world's population, almost half of whom have some degree of DR at any given time.

Epidemiological data over past decade have shown that the pattern and profile of type 2 diabetes mellitus is very

different in India as compared to west.⁴ An earlier study done on patients of diabetes mellitus in a clinic-based population reported an overall prevalence of 14 per cent. NPDR was observed in 6 per cent, while 4 per cent had macular oedema and 4 per cent had PDR.⁵ Asian Young Diabetes Research (ASDIAB) Study, reported the incidence of DR in 724 young diabetic subjects of age 12-40 years with duration of diabetes <12 months in 7 centres of four Asian countries. It is interesting to note that DR prevalence was least among Indians (5.3%) as compared to other ethnic groups like Malays (10%) and Chinese (15.1%).⁶ Higher levels of fasting C-peptide and glucagon stimulated C-peptide among the Indians in this

study may partly explain the lower prevalence of DR in this group.

Diabetic retinopathy is a very common, potentially preventable, long term, microvascular complication of diabetes mellitus and leading cause of visual disability and blindness. It is considered hallmark of generalized microangiopathy occurring in diabetic patient.

While there are many risk factors which have been associated with development and progression of diabetic retinopathy, duration of disease and age of patient are said to be strongest predictors. Hypertension, pregnancy, glucose control, dyslipidaemia, BMI, microalbuminuria and smoking are some of the other risk factors.

Preliminary data of the hospital shows predominant non-obese type 2 diabetes mellitus with high incidence of complications. Keeping in view of the above observations the present study was designed to study the lipid levels in patients of diabetes mellitus and further analyse the data with reference to occurrence of diabetic retinopathy.

METHODS

This study was observational case control type of study among patients attending diabetic clinic. Patients meeting inclusion criteria were divided into 30 cases as diabetics with retinopathy and 30 controls as diabetics without retinopathy. The data was further analysed for finding association between diabetic retinopathy and dyslipidaemia. Diagnosis of diabetes mellitus was based on American Diabetes Association (ADA) criteria. Based on their optic fundus findings diabetic retinopathy were divided into without DR and with DR. Those patients having DR were further divided into NPDR (Non-proliferative diabetic retinopathy) and PDR (Proliferative diabetic retinopathy). Dyslipidemia was defined according to NCEP ATP III guidelines.⁷ BMI: Calculated as weight in kilogram divided by height in m². Categorization done as per Indian Guidelines.

Patients with associated hypertension, on diuretics, β -blockers, hypolipemic agents, or any other drug or hormone known to influence lipid or lipoprotein metabolism, were excluded.

FBS, PPBS, HbA1c, Complete blood count, Fasting Lipid profile were done.

RESULTS

34 males (57%) and 26 (43%) females were recruited in the study, equally distributed among both groups. Age, sex, BMI, duration of diabetes were matched among cases and controls.

The mean age was 55 ± 9 years, youngest being 42 years, 16 patients in between 40-49 years, 22 patients in 50-59 years, 14 patients in between 60-69 years, 8 patients in

between 70-79 years, the oldest patient was aged 75 years (Figure 1).

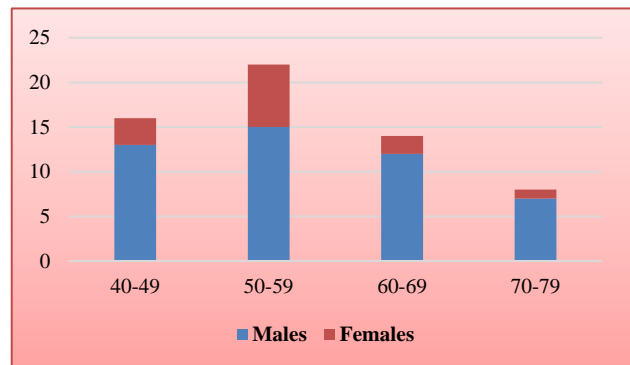


Figure 1: Age wise distribution of patients.

The mean duration of diabetes was 8.5 ± 5 years, with range from 5 months to 25 years, 18 (30%) patients had diabetes for less than 5 years, 22 (36%) had between 5-10 years and 20 (34%) had more than 10 years.

The BMI was <18.5 kg/m² in 6 (20%) patients, 18.6-22.9 kg/m² in 14 (23%), 23-27.9 kg/m² in 32 (53%), >28 kg/m² in 8 (13%). Equally distributed among both groups (Table 1).

Table 1: BMI in study groups.

BMI	Case	Control
<18.5	3	3
18.5-22.9	7	7
23-27.9	16	16
≥ 28	4	4

The average HbA1C was 8.2 ± 1.3 in Diabetic Retinopathy (DR) group and 7.5 ± 0.9 in patients with no Diabetic Retinopathy (NDR).

21 (70%) patients in DR group had dyslipidemia, whereas 13 (43.3%) patients in NDR had dyslipidemia, (Table 2).

Table 2: Dyslipidemia in cases and controls.

Groups	DR	No DR	P-value
Dyslipidaemia	21	13	0.034
No dyslipidaemia	9	17	

Average cholesterol was 188.30 ± 46.48 mg/dl in patients with DR, 182.50 ± 34.74 mg/dl in patients without DR.

Triglycerides level was 155.87 ± 49.07 mg/dl in DR group and 166.42 ± 44.35 mg/dl in NDR group, HDL was 50.93 ± 10.97 mg/dl in DR group, 51.90 ± 12.03 mg/dl in patients without DR. LDL levels was 97.27 ± 33.61 mg/dl in DR group, 99.62 ± 28.64 mg/dl in NDR group (Figure 2).

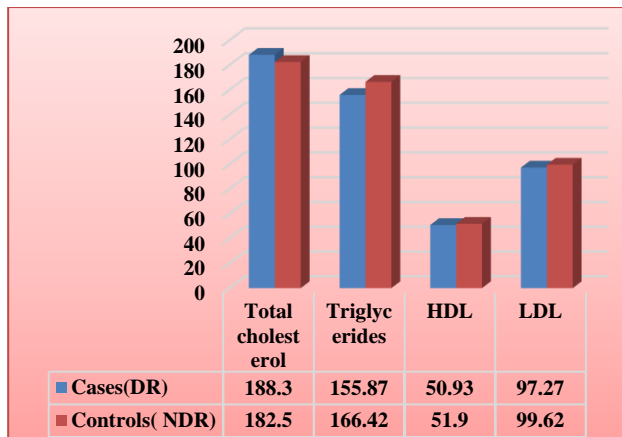


Figure 2: Lipid profile (average values) in cases and controls.

DISCUSSION

In the present study, diabetic patients were divided into patients having retinopathy as cases and patients without retinopathy as controls. 30 cases and 30 controls were taken. Equal no. of males and females were taken in both groups. Patients having hypertension and on drugs which can affect lipid metabolism were not included to minimize confounding. Mean age in patients having retinopathy was 55.77 ± 9.687 yrs. The relationship of retinopathy with age was in concordance to that found in many other studies. Like several other epidemiologic studies, this study also showed an increased prevalence of DR with increasing age. APED Study, CURES Eye Study, Dondana et al also have found significant correlation between the patient age and diabetic retinopathy.⁸⁻¹⁰ In the present study, the duration since diagnosis of diabetes (diabetic age) ranged from 5 months-25 years. There may be some bias in estimating the real duration of diabetes in these patients, as the detection of diabetes could have been delayed due to lack of symptoms and the insidious onset of type 2 diabetes. The mean duration of diabetes was divided in three groups <5 years, 5-10 years and >10 years. As the duration of diabetes increased there was significant increase in number of DR cases. The association of longer duration with a higher the risk of DR was in accordance with previously published reports (Wong et al, Varma et al).^{11,12} It is obvious that patients with retinopathy significantly had a longer mean duration of diabetes. Wisconsin Epidemiological Study of Diabetic Retinopathy (WESDR) also found that risk of retinopathy is directly related to the duration of diabetes. In India, virtually all studies have shown an increased prevalence of DR as the duration of diabetes increased, (Gupta et al, APEDS study).^{8,13} The CURES Eye study has found that for every 5 years increase in duration of diabetes, the risk for DR increased by 1.89 times. In present study dyslipidemia was more common in patients with diabetic retinopathy (21 cases) than those without DR (13 controls). This relation was found to be statistically significant ($p < 0.034$). On studying individual fraction of

lipid levels in patients having retinopathy, the mean cholesterol level was found to be raised 188.30 ± 46.48 as compared to 182.50 ± 34.74 in patients without DR. There is also inverse relationship observed between HDL levels and DR. But both these observations were not found to be statistically significant ($p > 0.05$). No relation was found between TGs and LDL levels with DR. The lack of association of lipid profile with severity of DR in this study is compatible with previous data from the Multi-Ethnic Study of Atherosclerosis, which show no association between serum lipids and DR and the Australian Diabetes, Obesity, and Lifestyle Study.^{8,14,15}

Similarly, Hove et al reported no significant association between DR, triglycerides, HDL and total cholesterol in diabetic population in Denmark. Miljanovic et al reported no lipid profile association with progression of DR or with PDR.^{16,17} In another study, there was no association between DR and lipid profile, however, clinically significant ME (Macular Edema) was found to be associated with serum lipids. Moreover, Singapore Malay Eye study showed that higher cholesterol levels were protective of any retinopathy.¹⁸ Contrary to findings in this study many studies in south India have found a significant association between serum lipid fractions and DR. As in this study DR was more commonly found in patients of dyslipidemia (p value < 0.05) but no significant association between different lipid fractions and DR was found so it can be postulated that some other factors like apolipoproteins (apo A1 and apo b) and not lipid fractions have a contributing role in DR. This is supported by some studies emphasizing on this association.^{19,20} These studies showed that diabetic retinopathy is more strongly associated with ratio of apo A1 and apo B as compared to individual lipid fractions. Another cause of discrepancy might be ethnicity-at least in part. Significant differences in the prevalence of DR and DME (Diabetic Macular Edema) between different ethnic groups was reported. Although all ethnic groups are susceptible to the established risk factors of DR such as duration the disease, severity of hyperglycemia and hypertension, ethnicity specific risk factors also may have an effect. Such risk factors may include differential susceptibility to conventional risk factors, insulin resistance, truncal obesity and genetic susceptibility. It may be hypothesized that serum lipid levels may also affect such different populations at a different level, however, this should be supported by further studies.

Limitations of this study are smaller sample size which may have accounted for statistically insignificant results. The study did not evaluate other risk factors for the development of retinopathy. Most of the diabetics in the present study had poor glycemic control. Hyperglycemia is also associated with dyslipidemia, specifically increased levels of total cholesterol and triglycerides, a slight elevation of LDL, but generally little if any change in HDL. Consequently, hyperglycemia may be an important confounding factor in this study.

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REFERENCES

1. Bloomgarden ZT. American Diabetes Association 60th Scientific Sessions. Diabetes Care. 2000;24:779-84.
2. Brinchmann-Hansen O, Dahl-Jorgensen K, Hanssen KF, Sandvik L. The response of diabetic retinopathy to 41 months of multiple insulin injections, insulin pumps, and conventional insulin therapy. Arch Ophthalmol. 1988;106:1232-46.
3. Buse JB. Management of glycemia in type 2 diabetes. Clin Cornerstone. 1998;1:39-57.
4. Hoet JJ, Tripathy BB. Report of the international workshop on types of diabetes peculiar to tropics. Diabetes care. 1996;19:1014.
5. Mohan R, Mohan V, Ramachandran A, Viswanathan M. Retinopathy in insulin dependent diabetes mellitus (IDDM) in south India. J Assoc Physicians India. 1989;37:370-3.
6. Rema M, Mohan V. Retinopathy at diagnosis among young Asian diabetic patients- ASDIAB study group. Diabetes. 2002;51(Suppl 2):A206-7.
7. Third report of National Cholesterol Education Program (NCEP): Expert Panel on detection, evaluation and treatment of high blood cholesterol in adults (Adult Treatment Panel III) Final Report High Blood Cholesterol in Adults. NIH. Pub. No. 02—5215. Bethesda, MD: National Heart, Lung and Blood Institute. Sept 2002;284.
8. Krishnaiah S, Das T, Nirmalan PK, Shamanna BR, Nutheti R, Rao GN et al. Risk factors for diabetic retinopathy: findings from the Andhra Pradesh eye disease study. Clin Ophthalmol. 2007 December;1(4):475-82.
9. Rema M, Srivastava BK, Anitha B, Deepa R, Mohan V. Association of serum lipids with diabetic retinopathy in urban south Indians - The Chennai Urban Rural Epidemiology Study (CURES) Eye Study-2. Diab Med. 2005;23:1029-36.
10. Dandona L, Dandona R, Naduvilath TJ, McCarty CA, Rao GN. Population based assessment of diabetic retinopathy in an urban population in southern India. Br J Ophthalmol. 1999;83:937-40.
11. Wong TY, Klein R, Islam A, Cotch MF, Folsom AR, Klein BE, et al. Diabetic retinopathy in a multiethnic cohort in the United States. Am J Ophthalmol. 2006;141:446-55.
12. Varma R. Diabetic retinopathy: challenges and future directions. Am J Ophthalmol. 2006;141:539-41.
13. Gupta S, Ambade A. Prevalence of diabetic retinopathy and influencing factors amongst type 2 diabetics from central India. Int J Diab Dev Ctries. 2004;24:75-8.
14. Tapp RJ, Shaw JE, Harper CA, De Courten MP, Balkau B, McCarty DJ, et al. The prevalence of and factors associated with diabetic retinopathy in the Australian population. Diabetes Care. 2003 Jun 1;26(6):1731-7.
15. Benarous R, Sasongko MB, Qureshi S, Fenwick E, Dirani M, Wong TY, et al. Differential association of serum lipids with diabetic retinopathy and diabetic macular edema. Invest Ophthalmol Vis Sci. 2011;52(10):7464-9.
16. Hove MN, Kristensen JK, Lauritzen T, Bek T. The prevalence of retinopathy in an unselected population of type 2 diabetes patients from Aarhus County, Denmark. Acta Ophthalmol Scand. 2004;82(4):443-8.
17. Miljanovic B, Glynn RJ, Nathan DM, Manson JE, Schaumberg DA. A prospective study of serum lipids and risk of diabetic macular edema in type 1 diabetes. Diabetes. 2004;53(11):2883-92.
18. Wong TY, Cheung N, Tay WT, Wang JJ, Aung T, Saw SM, et al. Prevalence and risk factors for diabetic retinopathy: the Singapore Malay Eye Study. Ophthalmol. 2008;115:1869-75.
19. Sasongko MB, Wong TY, Nguyen TT, Kawasaki R, Jenkins A, Shaw J, et al. Serum apolipoprotein AI and B are stronger biomarkers of diabetic retinopathy than traditional lipids. Diabetes Care. 2011 Feb 1;34(2):474-9.
20. Hu A, Luo Y, Li T, Guo X, Ding X, Zhu X, et al. Low serum apolipoprotein A1/B ratio is associated with proliferative diabetic retinopathy in type 2 diabetes. Graefes Archive Clinical Exp Ophthalmol. 2012;250(7):957-62.

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