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Original Research

Assessment of hypercholesterolemia and retinopathy in prediabetics

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***ABSTRACT*:**
Background: Diabetes (T2DM) and related cardiovascular complications are major public health challenges worldwide. The present study was conducted to assess hypercholesterolemia and retinopathy in prediabetes. **Materials & Methods:** 120 pre- diabetic and diabetic subjects underwent fasting serum lipids (total cholesterol, T-Chol; triglycerides, Tg; low density lipoprotein cholesterol, LDL-C and high-density lipoprotein cholesterol, HDL-C). **Results:** Out of 120 subjects, males were 70 and females were 50. The mean cholesterol (mmol/L) in healthy, pre- diabetics and diabetics was 4.1, 4.5 and 4.9, triglyceride (mmol/L) was 1.1, 1.5 and 1.8, HDL (mmol/L) was 0.90, 0.84 and 0.80, LDL (mmol/L) was 2.74, 2.80 and 2.86 respectively. There was correlation of cholesterol, triglyceride in pre-diabetic and diabetic ($P< 0.05$). 34 (28.3%) had diabetic retinopathy. **Conclusion:** There was a high lipid profile in pre-diabetics and diabetics. The prevalence of diabetic retinopathy was also high.
Key words: Diabetic retinopathy, Lipid, Cholesterol

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INTRODUCTION

Diabetes (T2DM) and related cardiovascular complications are major public health challenges worldwide.[1] Individuals with T2DM have two to four-fold increased risk of coronary artery disease (CAD), the leading cause of death among people with T2DM.[2] Dyslipidaemia and hypertension are major modifiable risk factors for T2DM and related CAD, which account for more than 87% of disability in low- and middle-income countries.[3]

Among those, 90–95% cases will have type 2 diabetes, and obesity is considered as one of the major contributors to these staggering numbers.[4] Type 2 diabetes comes with an additional burden of moderate to severe hyperlipidaemia, and the characteristic features of diabetic dyslipidaemia are high plasma triglycerides and low density lipoprotein cholesterol (LDL), and reduced levels of high density lipoprotein cholesterol.[5] These patients are at substantially increased risk of developing macrovascular and microvascular complications including retinopathy and nephropathy. Retinopathy, a slow progressing disease, affects the vast majority of patients with 20–25 years of diabetes.[6] The pathogenesis of this blinding disease is complex and many biochemical, metabolic and molecular mechanisms are implicated in its development.

Early Treatment of Diabetic Retinopathy Study (ETDRS) has shown a relationship between retinal hard exudates and total and LDL cholesterol. In addition, clinical trials using long-term administration of lipid-lowering therapy, fenofibrate have documented a significant relative reduction of progression of diabetic retinopathy in patients with background retinopathy. The present study was conducted to assess hypercholesterolemia and retinopathy in prediabetes.

MATERIALS & METHODS:

The present study comprised of 120 pre-diabetic and diabetic subjects of both genders. Equal number of normal healthy subjects was also recruited. All were informed regarding the study and their written consent was obtained.

Demographic profiles such as name, age, gender etc. was recorded. All underwent Anthropometric measures, blood pressure, blood glucose (fasting and 2-h oral glucose

tolerance test) and fasting serum lipids (total cholesterol, T-Chol; triglycerides, Tg; low density lipoprotein cholesterol, LDL-C and high-density lipoprotein cholesterol, HDL-C). The occurrence of retinopathy was also assessed by an expert eye surgeon. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

Table I Distribution of subjects

Total- 120		
Gender	**Males**	**Females**
Number	70	50

Table I shows that out of 120 subjects, males were 70 and females were 50.

RESULTS

Table II Assessment of lipid profile

Lipid profile	**Healthy**	**Pre- diabetics**	**Diabetics**	**P value**
Cholesterol (mmol/L)	4.1	4.5	4.9	0.04
Triglyceride (mmol/L)	1.1	1.5	1.8	0.01
HDL (mmol/L)	0.90	0.84	0.80	0.02
LDL (mmol/L)	2.74	2.80	2.86	0.05

Table II, graph I shows that mean cholesterol (mmol/L) in healthy, pre- diabetics and diabetics was 4.1, 4.5 and 4.9, triglyceride (mmol/L) was 1.1, 1.5 and 1.8, HDL (mmol/L) was 0.90, 0.84 and 0.80, LDL (mmol/L) was 2.74, 2.80 and 2.86 respectively. The difference was significant (P< 0.05). Table III shows that there was correlation of cholesterol, triglyceride in pre- diabetic and diabetic (P< 0.05). Table IV shows that 34 (28.3%) had diabetic retinopathy.

Graph I Assessment of lipid profile

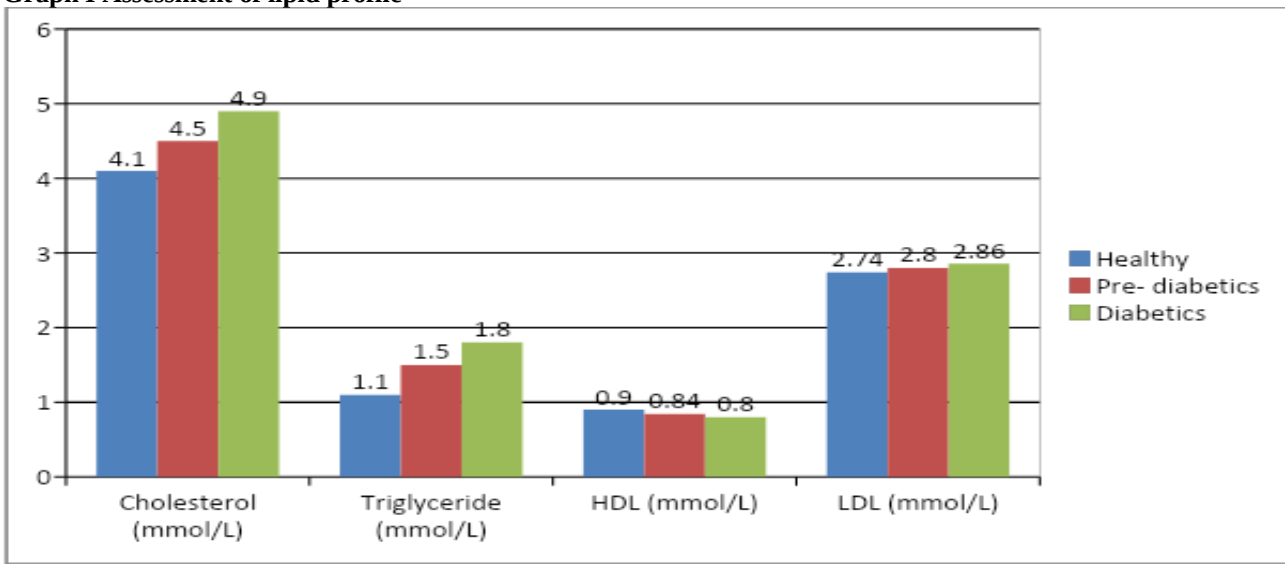

Table III Odds ratio (OR) with 95% CI of different lipid parameters for having risk of T2DM and prediabetes

Lipid profile	**Pre- diabetics**		**Diabetics**	
	OR	**P value**	**OR**	**P value**
Cholesterol	1.92	0.01	2.40	0.02
Triglyceride	1.96	0.03	3.90	0.01
HDL	2.92	0.13	2.16	0.04
LDL	1.43	0.19	0.74	1.12

Table IV Prevalence of diabetic retinopathy

Total	**Diabetic retinopathy**	**Percentage**
120	34	28.3

DISCUSSION

Diabetes mellitus is characterized by chronic hyperglycaemia with disturbances in carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both.[7] The global figure of people suffering from diabetes mellitus is estimated to rise from current estimate of 415 million to 642 million by 2040. The number of people with type 2 diabetes mellitus is increasing in every country and 75% of people with diabetes mellitus are living in developing countries.[8] With an increasing incidence worldwide, diabetes mellitus will be a likely leading cause of morbidity and mortality in the future. It is well established that dyslipidaemia is a major risk factor for macrovascular complications in patients with type-2 diabetes mellitus (T2DM) and affects 10%-73% of this population.[9] Dyslipidaemia in diabetes commonly manifests as raised low density lipoprotein cholesterol (LDL-C), decreased high-density lipoprotein cholesterol (HDL-C) levels, or elevated triglyceride (TG) levels. Furthermore, data from the United Kingdom Prospective Diabetes Study suggest that both decreased HDL-C and elevated LDL-C predict CVD in diabetes. All national and international guidelines recommend aggressive management of lipids in this population.[10] The present study was conducted to assess hypercholesterolemia and retinopathy in prediabetes. In present study, out of 120 subjects, males were 70 and females were 50. The mean cholesterol (mmol/L) in healthy, pre-diabetics and diabetics was 4.1, 4.5 and 4.9, triglyceride (mmol/L) was 1.1, 1.5 and 1.8, HDL (mmol/L) was 0.90, 0.84 and 0.80, LDL (mmol/L) was 2.74, 2.80 and 2.86 respectively. Saurabh et al[11] 50 patients of type 2 diabetes mellitus and 50 age and sex matched healthy controls were taken after obtaining written and informed consent from them. HbA1c and Lipid profile were done in cases and controls using appropriate tests. There was a highly significant difference in mean HDL in diabetic patients (39.66 ± 10.17) and controls (52.02 ± 11.15). The study demonstrated the typical diabetic dyslipidaemia which is characterized by low HDL, high triglyceride. No significant correlation was found between HbA1c and TC, LDL, HDL and TG. Various studies conducted across India and abroad have found conflicting results, and there is no standardized protocol to compare the results of these studies, hence more structured and long-term studies on a larger number of patients are needed to validate HbA1c as a marker of dyslipidaemia.

We observed that there was correlation of cholesterol, triglyceride in pre- diabetic and diabetic ($P< 0.05$). We found that 34 (28.3%) had diabetic retinopathy. Bhowmik et al[12] found high Tg levels were seen in 26% to 64% of the participants, depending on glucose tolerance status. Low HDL-C levels were seen in all groups (>90%). Significant linear trends were observed for high T-Chol, high Tg and low HDL-C with increasing glucose intolerance (p for trend < 0.001), high Tg (OR: 3.91, $p < 0.001$) and low HDL-C (OR: 2.17, $p = 0.044$). Prediabetes showed a significant association with high Tg (OR: 1.96, $p < 0.001$) and low HDL-C (OR: 2.93, $p = 0.011$). Participants with combined high Tg and low HDL-C levels had a 12.75-fold higher OR for T2DM and 4.89 OR for prediabetes. In Asian Indian populations an assessment of serum lipids is warranted not only for T2DM patients, but also for those with prediabetes.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that there was a high lipid profile in pre-diabetics and diabetics. The prevalence of diabetic retinopathy was also high.

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