Study of Lipid Profile in Type 2 Diabetes Mellitus Patients and its Correlation with HbA1c

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ABSTRACT

Introduction: 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. Dyslipidemia 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. Many studies have proposed HbA1c to be used as a biomarker of both glycaemic control and dyslipidemia in type 2 diabetes mellitus. Study aimed to observe the lipid profile in type 2 diabetes mellitus patients and to find out the correlation between glycated haemoglobin (HbA1c) and lipid profile in type 2 diabetes mellitus patients.

Material and methods: This is a cross sectional case control study conducted at Rohilkhand medical college and hospital from September 2015 to February 2016, after taking ethical clearance from the college ethical committee. 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. The data was analyzed with SPSS version 22.0. The mean, SD, independent t test and correlation (Pearson's) test were used to interpret the results.

Results: There was highly significant difference in mean HDL in diabetic patients(39.66 ± 10.17) and controls(52.02 ± 11.15) (p<0.0001). Also a highly significant difference was found in mean triglyceride in diabetic patients (185.70 ± 76.87) and controls(125.22 ± 17.14) (p<0.0001). There was no significant correlation found between HbA1c and TC, LDL, HDL, TG.

Conclusion: The study demonstrated the typical diabetic dyslipidemia 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 larger no of patients are needed to validate HbA1c as a marker of dyslipidemia.

Keywords: Lipid Profile, Type 2 Diabetes, Mellitus Patients, HbA1c

INTRODUCTION

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.[1] 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.[2] With an increasing incidence worldwide, diabetes mellitus will be a likely leading cause of morbidity and mortality in the future.[3]

It is well established that dyslipidemia is a major risk factor for macrovascular complications in patients with type-2 diabetes mellitus (T2DM) and affects 10%-73% of this population.[4] Dyslipidemia 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.[5,6]

Glycated haemoglobin (HbA1c) is a routinely used marker for long-term glycaemic control. Apart from functioning as an indicator for the mean blood glucose level, HbA1c also predicts the risk for the development of diabetic complications in diabetes patients.[7]

Many studies have proposed HbA1c to be used as a biomarker of both glycaemic control and dyslipidemia in type 2 diabetes mellitus.[8-10] Thus, the aim of this study was to observe the lipid profile in type 2 diabetes mellitus patients and to find out the correlation between glycated haemoglobin (HbA1c) and lipid profile in type 2 diabetes patients, and to know whether HbA1c can be used as a biomarker of dyslipidemia or not.

MATERIAL AND METHODS

The study was a cross sectional, case control study done in department of medicine, Rohilkhand Medical College and Hospital in which the patients were selected as per the inclusion and exclusion criteria.

50 patients of Type 2 diabetes mellitus admitted in Department of Medicine, RMCH, Bareilly during the period of September 2015 to February 2016 were taken for the study, after taking ethical clearance from the college ethical committee. Written and informed consent was also taken. 50 age and sex matched healthy controls were also included in the study.

Inclusion criteria
Type 2 diabetes mellitus patients in the age range of 20-85 years.

Exclusion criteria
1. T2DM patients with concomitant diseases or conditions affecting lipid levels like chronic liver disease and hypothyroidism.
2. Patients on drugs like oral contraceptive pills, steroids and diuretics.

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Parameters	Cases (n=50)	Controls (n=50)	p- value
Mean FBS	205.04 ± 91.47	83.68 ± 8.80	<0.0001**
Mean HbA1c	8.92 ± 1.64	5.33 ± 0.22	<0.0001**
Mean Total cholesterol (normal value:130-200mg/dl)	169.04±47.36	169.68±15.61	0.9279
Mean LDL (normal value: <130mg/dl)	91.52 ± 32.21	100.26 ± 16.54	0.0910
Mean HDL (High risk: <40mg/dl)	39.66 ± 10.17	52.02 ± 11.15	<0.0001**
Mean Triglycerides(normal value: <150)	185.70 ± 76.87	125.22 ± 17.14	<0.0001**
*p<0.05 consider statistically significant.** highly significant.			
Table-1: Comparison of mean values of biochemical parameters in cases and controls.			

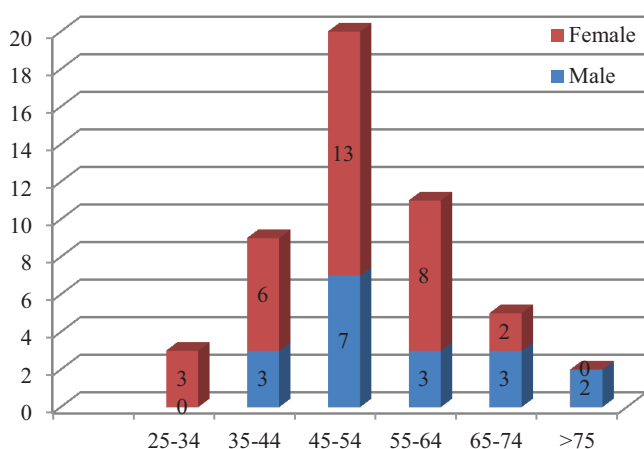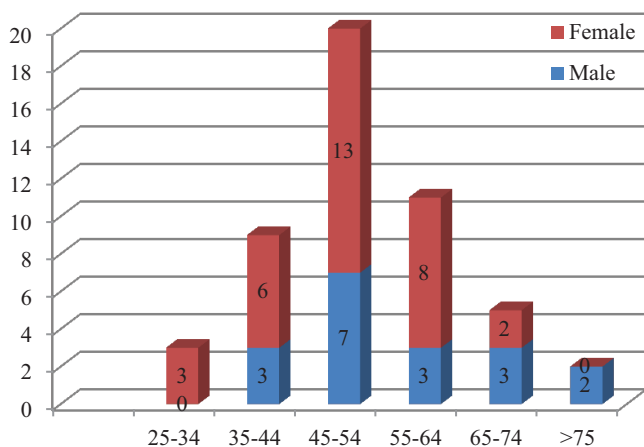| Correlation between HbA1c and lipid profile	Correlation coefficient(r)
TC	.066
LDL	.122
HDL	-.039
TG	.080
Table-2: Correlation between HbA1c Values and Lipid Profile	

Figure-1: Cases

Figure-2: Controls

The Lipid Profile - total cholesterol (TC), high density lipoprotein (HDL) and Triglycerides(TG)] of each subject was measured by using Erba Blood Analyzer. The low density lipoprotein (LDL) was calculated by using Friedewald formula: LDL= TC–(TG/5) -HDL. The glycated haemoglobin (HbA1c) was estimated by appropriate standard kits.

STATISTICAL ANALYSIS

The data was analyzed with SPSS version 22.0. The mean, SD, independent t test and correlation (Pearson's) test were used to interpret the results.

RESULTS

This was a cross sectional, case control, hospital based study on 50 type 2 diabetes mellitus patients attending in OPD/IPD with equal number of age and sex matched controls during September 2015 to February 2016.

Mean age in both diabetic and control patients was 50.3± 11.90 years and age range was 25-85 years. Both groups were well matched for age and sex distribution.

There was highly significant difference in mean HDL in diabetic and control patients (p<0.0001) (table-1). There was highly significant difference in mean Triglycerides in diabetic and control patients (p<0.0001) (table-1). There was no significant correlation found between HbA1c and TC, LDL, HDL, TG (table-2).

DISCUSSION

Mean age of diabetic patients was 50.3+-11.90 years [Age range 25-85 years] with female preponderance (graph-1). These values were similar to those reported by Kumar et al from same institution and similar cohort.[11]

This study also demonstrates the typical diabetic dyslipidemia which is characterized by low HDL, high triglyceride (Table 1). Various national and international epidemiological studies on lipid profile have also shown this pattern of dyslipidemia.[12-16]

No significant difference was observed in total cholesterol and absolute LDL levels in cases and controls in this study. Even if the absolute concentration of LDL cholesterol (LDL-c) is not significantly increased; there is typically a preponderance of smaller, denser LDL particles, which possibly increases atherogenicity (atherogenic dyslipedemia).These changes are due to increased free fatty acid flux secondary to insulin resistance.[15,17-20]

No significant correlation was found between HbA1c and TC, LDL, HDL and TG (Table-2). Senthilkumar et al[21], conducted a perspective study on 162 type 2 diabetes mellitus patients in Tamil Nadu. They found no significant correlation of HbA1c with TC, LDL, HDL and TG.

Jayesh et al[22] conducted a prospective study on western Indian population that comprised of 430 type 2 diabetes mellitus patients and 501 non diabetic control subjects. They found significant correlation of HbA1c with TC and LDL.

Zhe Yan et al[23] conducted a study on 128 type 2 diabetes mellitus patients in Sichuan, China. They found significant correlation of HbA1c with LDL.

Eglal et al[24] a study on 50 type 2 diabetes mellitus patients in Khartoum Sudan, they found significant correlation of HbA1c

with TG.

CONCLUSION

Diabetic dyslipidemia or atherogenic dyslipidemia is characterized by low HDL, high TG and high small dense LDL. Early screening of diabetic patients for dyslipidemia and early intervention is required to minimize the risk of future cardiovascular mortality. In our study no significant correlation was observed between HbA1c and various parameters of lipid profile, and there is no standardized protocol to compare the results of various other studies hence more structured and long term studies on larger no of patients are needed to validate HbA1c as a marker of dyslipidemia.

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International Journal of Contemporary Medical Research
ISSN (Online): 2393-915X; (Print): 2454-7379 | ICV (2015): 77.83 | Volume 4 | Issue 2 | February 2017

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