Studying the lipid profile in type 2 diabetes mellitus patients and it's correlation with HbA1c

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Abstract
Background: Glycated hemoglobin (HbA1c) is routinely used marker for long term glycemic control. In accordance with its function as an indicator for the mean blood glucose level, HbA1c predicts the risk for the development of diabetic complication in diabetes patients.[3] Type 2 diabetic patients have markedly increased risk of coronary heart disease than similarly dyslipidemic non diabetic subjects. diabetic (dyslipidemia) is characterized by 3 lipoprotein abnormalities: elevated very-low-density lipoproteins (VLDL), small LDL particles, and low high-density lipoprotein (HDL) cholesterol (the lipid triad).[4] In our study total 100 patients were taken and cross-sectional observational study was done. we have included both male and female of age more than 30 years and Male: female ratio was 1.32:1. Height, weight, Body Mass Index (BMI) was measured and baseline investigations like complete blood count, fasting and post prandial blood sugar, lipid profile, HbA1C and other investigations like serum urea, creatinine, electrolytes, cholesterol, urine analysis and chest x-ray were carried out as per the necessity. In the study we observed that, mean values were higher for Sr. HDL in patients on treatment and for rest parameters, it was higher for Sr. Cholesterol, Sr. LDL, Sr. VLDL and Triglycerides in patients who were not on treatment currently. This association of Lipid Profile of the study subjects with the status of the treatment was statistically significant for all the parameters of lipid profile except Sr. HDL. This study showed significant correlation between HbA1C and lipid profile parameters between the two groups ($\leq$ 7% and >7% of HbA1c). The results suggested the importance of glycemic control in order to manage dyslipidemia in type 2 diabetes. So, HbA1C, glycemic control as well as lipid profile indicator can be used for screening of high risk patients for early diagnosis of dyslipidemia.
Key words: diabetes, HbA1C, lipid profile.

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INTRODUCTION
Diabetes is an "iceberg" disease. Although there is increase in both the prevalence and incidence of type 2 diabetes have occurred globally, they have been especially dramatic in societies in economic transition, in newly industrialized countries and in developing countries.[1] Several epidemiologic and clinical studies indicate a direct relation between hyperglycemia and neuropathy, retinopathy, atherosclerosis and coronary artery disease.[2] Glycated hemoglobin (HbA1c) is routinely used marker for long term glycemic control. HbA1c predicts the risk for the development of complications in diabetic patients. Estimated risk of CVD has shown to be increased by 18% for each 1% increase in absolute HbA1c value in diabetic.[3] Untreated type 1 diabetes can cause severe hypertriglyceridemia, but lipid levels are nearly normal in non-obese patients with well controlled type 1 diabetes.[4] Central obesity is the most important predisposing factor for insulin resistance.[5] Both obesity and the metabolic syndrome are associated with high mortality mainly related to cardiovascular disease.[6] These both diseases have recently emerged as strong independent risk factors for chronic kidney disease (CKD) and ESRD.[7] Patients with

type 2 diabetes often exhibit an atherogenic lipid profile, which greatly increases their risk of CVD compared with people without diabetes. [8]

MATERIAL AND METHODS

This cross sectional observational study was conducted on 100 selected patients with history of diabetes mellitus from outpatient department/ admitted to ward /ICU of Department of General Medicine in a Government Medical College and Hospital which is a Tertiary care Centre and written informed consent was taken from every patient. We included the male and female patients of type 2 diabetes mellitus patients of age more than 30 years. We have excluded the terminally ill and vitally unstable type 2 diabetes mellitus patients. Also we excluded the patients with the conditions where derranged lipid profile like chronic liver disease and hypothyroidism and patients on drugs which was going to affect the lipid profile like steroids, diuretics, etc. and diseases that affects HbA1C like thalassemia, sickle cell disease.

OBSERVATIONS AND RESULTS

There was no any statistical significance in number of males and females involved in study. Out of 100 patients, 70 were on treatment and 30 were not on any treatment or stopped taking treatment. Out of total study subjects on treatment, each of 25 were with normal BMI and obese patients and 20 were overweight. Out of total 30 study subjects not on treatment, 7 were with normal BMI and 15 were obese patients and there were 8 overweight patients. FBS for the patients on treatment was 124.43±23.85 and for that not on or stopped treatment, was 134.63±22.31mg/dl. This association of FBS with the treatment was statistically significant. postprandial Blood Sugar (PPBS) for patients on treatment was 229.76±72.59and for those not on or stopped treatment, was 245.63±82.97 mg/dl. This association of PPBS with the treatment was not statistically significant. Mean values were higher for Sr. HDL in patients on treatment and for rest parameters; it was higher for Sr. Cholesterol, Sr. LDL, Sr. VLDL and Triglycerides in patients who were not on treatment now. This association of Lipid Profile of the study subjects with the status of the treatment was statistically significant for all the parameters of lipid profile except Sr. HDL as shown in the table number-1:

Table 1:

Lipid parameter	On treatment (Mean ±SD)	Not on or stopped t/t (Mean ±SD)	P value (t test)
Sr. Cholesterol	199.60±27.40	221.13±48.91	0.0061
Sr. HDL	37.33±6.82	36.7±5.92	0.6612
Sr. LDL	130.16±23.60	146.73±22.17	0.0015
Sr. VLDL	28.30±6.70	32.13±7.35	0.0063
Triglycerides	165.40±20.41	184.73±25.39	0.0001

The proportion of the study subjects with HbA1C >7, was 27(38.57%) in On treatment patients and 24(80.00%) for patients not on or stopped t/t. The proportion of the study subjects with HbA1C ≤7 was 43(61.43%) in on treatment patients and 6(20.00%) for patients not on or stopped t/t. This association of HbA1C with the treatment status was statistically highly significant. **HbA1C within the 2 groups of study subjects given in graph 1 as**:
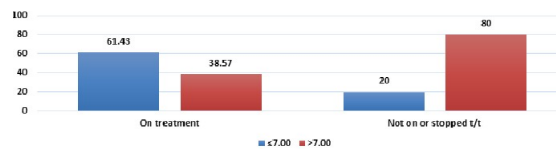

Figure 1:

The proportion of males was more in patients with HbA1C ≤7 was 29 (59.18%) and those who are having HbA1C >7 was 28 (54.90%). The proportion of the females with HbA1C ≤7.00 was 20(40.82%) and 23(45.10%) in patients with having HbA1C >7.00. The association of sex and HbA1C was statistically not significant. The association of age in years and HbA1C conc. was statistically not significant. The proportion of obese patients was higher in patients with HbA1C >7.00 (49.02%) and that of normal patients in in patients with HbA1C >7.00 (42.86%). The proportion of overweight patients was slightly higher in patients with HbA1C >7.00, (29.41%) as compared to in patients with HbA1C ≤7.00 (26.53%). This association of BMI and HbA1C concentration was statistically significant. So the BMI and HbA1C in study subjects is given in graph 2 as :
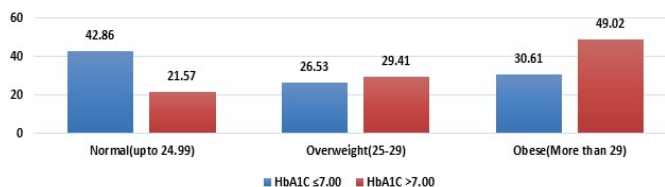
Figure 2:

The lipid profile was significantly related to HbA1C concentration in case of Sr. Cholesterol, Sr. LDL and Triglycerides and the relation was not significant in case of Sr .HDL and Sr. VLDL.

Table 2: Mean Lipid profile and HbA1C in the study subjects

Lipid profile	HbA1C ≤7.00	HbA1C >7.00	P value (t test)
Sr. Cholesterol	201.43±35.14	219.51±37.60	0.0148
Sr. HDL	37.84±7.28	36.47±6.16	0.3115
Sr. LDL	127.67±21.34	145.24±25.57	0.0003
Sr. VLDL	28.10±6.24	28.98±7.81	0.5361
Triglycerides	161.78±17.85	184.37±25.47	<<0.0001

DISCUSSION

There was slight male preponderance in the study. Out of total, 57 were males and rest 43 were females. Most common age group of presentation of DM was 51-60 years, 34% patients were from that group. There were total 100 patients participated in the study. Of these 100, 30 were with irregular and/or not at all taken t/t and/or stopped treatment after some time. Out of total study subjects on treatment, each of 25(35.71%) were with normal BMI and obese patients. 20(28.58%) overweight patients were present in the study. Out of total 30 study subjects not on treatment, 7(23.33%) were with normal BMI and 15(50.00%) were obese patients and there were 8(26.67%) overweight patients. The mean value of BMI of the study subjects was 27.10±4.52 and 29.14±4.68 for patients who were on treatment and who were not on or stopped t/t respectively. This association of BMI of the patients with the ongoing treatment was statistically significant. In our study, FBS for the patients on treatment was 124.43±23.85 and for those not on or stopped t/t it was 134.63±22.31mg/dl. This association of FBS with the treatment was statistically significant. PPBS for patients on treatment was 229.76±72.59and for those not on or stopped t/t it was 245.63±82.97 mg/dl. This association of PPBS with the treatment was not statistically significant. As per the findings of the study by Tayde P et al.., Fasting Blood Sugar (FBS) (mg %) in cases was 148.78 ± 22.5 and in controls was 84.92 ± 7.94 and PPBS (mg %) was 253.24 ± 23.38 in cases and in controls it was 119.84 ± 7.48. This mean value of FBS and PPBS in cases in controls was statistically highly significant in the study by Tayde P et al.. [9] similar to our study finding. Similarly for patients not on treatment, mean values of Sr. Cholesterol, Sr. HDL, Sr. LDL, Sr. VLDL and Triglycerides for on treatment patients were 221.13±48.91, 36.7±5.92, 146.73±22.17, 32.13±7.35 and 184.73±25.39 respectively. This association of Lipid Profile of the study subjects with the status of the treatment was statistically significant for all the parameters of lipid profile except Sr HDL as shown in the table. The association of Lipid Profile of the study subjects in cases and controls was statistically significant for all the parameters of lipid profile in the studies by Taha D et al..[10] and Watson KE et al.[11] The proportion of the study subjects with HbA1C >7.00 was 27(38.57%) in on treatment patients and 24(80.00%) for patients not on or stopped t/t. The proportion of the study subjects with HbA1C ≤7.00 was 43(61.43%) in on treatment patients and 6(20.00%) for patients not on or stopped t/t as shown in graph number 1: This association of HbA1C with the treatment status was statistically highly significant.

In the study by Tayde P et al.[9] the mean values of HbA1C was 8.41 ± 0.74 and 5.10 ± 0.73 in cases and controls respectively. In the study by Dr. Anand [12] on type 2 DM patients, the mean value of HbA1C was 5.41±0.63 and 5.70±0.66 in cases and controls respectively which was statistically not significant. Compared to our study these value were far lesser and also not significant. Similarly, in our study, association of BMI and HbA1C concentration was statistically significant as shown in graph number 2. In this study it was observed that type 2 diabetics on treatment had significantly higher BMI of Preobese range than patients who were currently not on treatment. The findings were in agreement with those observed by Abbasi F et al.[13] and Hettihewa LM et al.[14] The lipid profile was significantly related to HbA1C concentration in case of Sr. Cholesterol, Sr. LDL and Triglycerides and the relation was not significant in case of Sr .HDL and Sr. VLDL in our study. The lipid profile was significantly related to HbA1C concentration in case of Sr. Cholesterol, Sr. LDL and Triglycerides and the relation was not significant in case of Sr. HDL in the study by Dr. Anand.[12] But as per the study findings of Tayde P et al.,[9] all the lipid profile parameters were statistically significantly related to the HbA1C concentration which was not the case in our study.

CONCLUSION

Most common age group of presentation of DM was 51-60 years. The association of BMI of the patients with the ongoing treatment was statistically significant. Both FBS and PPBS were associated significantly with the status of the treatment. Mean values were higher for Sr. HDL in patients on treatment and for rest parameters; it was higher for Sr. Cholesterol, Sr. LDL Sr. VLDL and Triglycerides in patients who were not on treatment now. This association of Lipid Profile of the study subjects with the status of the treatment was statistically significant for all the parameters of lipid profile except Sr. HDL. The association of sex and age group with the HbA1C was statistically not significant. Also the association of BMI and HbA1C concentration was statistically significant. Based on the above findings it can be concluded that type 2 diabetic males with poorly controlled diabetes had significantly deranged lipid profile as compared to normal study subjects and were at increased risk of dyslipidaemias. Also the levels of glycated haemoglobin were significantly correlated with the lipid parameters and the BMI. Hence it was recommended that the glycaemic control in terms of glycated haemoglobin should be achieved so as to decrease the risk of deranged lipid profile and subsequently the risk of cardio metabolic changes. In our cross sectional observational study showed the significant correlation between HbA1C and lipid profile parameters between the two groups (≤ 7% and >7% of HbA1C.) The results suggested the importance of glycaemic control in order to manage dyslipidaemia in type 2 diabetes. HbA1C has the ability of predicting serum lipoprotein in both diabetic and non-diabetic population irrespective of the gender. Previous studies also established HbA1C as the gold standard of glycaemic control. This dual biomarker- HbA1C, glycaemic control as well as lipid profile indicator can be used for screening of high risk patients for early diagnosis of dyslipidaemia and by this, we can prevent and postpone the complications of DM (and also of cardiovascular disease) by timely intervention of the disease.

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