ORIGINAL ARTICLE

Serum Triglyceride to HDL Ratio in Patients with Type 2 Diabetes Mellitus in teaching hospital of Lahore

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ABSTRACT

Aim: To know serum triglyceride to HDL-cholesterol ratio in Type 2 diabetic patients.
Study design: Observational study
Place and duration of study: Department of medicine, GTTH Lahore from 15-08-2014 till 15-10-2014.
Methods: Analysis included data of 95 patients, who were either admitted or reported to the diabetic clinic of GTTH, Lahore Pakistan. All patients were suffering from Type 2 diabetes mellitus. Hypertriglyceridemia due to other causes like, nephrotic syndrome, hypothyroidism and Type 1 diabetes mellitus were excluded from the study. Serum HDL-Cholesterol was measured in each patient. The Triglyceride/HDL-Cholesterol ratio was calculated. Chi-square test was applied and p-value of <0.05 was accepted as significant.
RESULTS: A total of 95 patients suffering from Type 2 diabetes mellitus and fulfilling the inclusion criteria were enrolled in the study. Among the patients studied, mean fasting blood glucose was 173.96±39.2, mean fasting serum triglyceride was 206.15±50.41 and mean HDL-cholesterol was 44.51±7.56. The mean calculated ratio between triglyceride and HDL-cholesterol was 4.85±1.75.
Conclusion: Markedly high levels of TG/HDL-cholesterol ratio was seen in patients with elevated triglyceride and low HDL-cholesterol levels.
Keywords: Fasting blood glucose, serum triglyceride, HDL-cholesterol, TG/HDL-c

INTRODUCTION

Diabetes mellitus induces a state of dyslipidemia with abnormalities in all lipoproteins namely, LDL-cholesterol, HDL-cholesterol and Triglyceride levels. Type 2 diabetes is associated with various patterns of dyslipidemias that predispose patients to macro vascular complications like coronary heart disease. Dyslipidemia in Type 2 diabetes is characterized by moderate hypertriglyceridemia and low level of HDL-cholesterol.[1] Once clinical disease develops the patients have a poor prognosis, than normglycemic individuals with normal lipids. Similarly hypertriglyceridemia with low HDL-cholesterol represent a high risk group for Coronary Heart Disease, (CHD) morbidity and mortality in Type 2 diabetes[2]. Hypertriglyceridemia, itself is an independent risk factor for CHD[3]. Frequent coexistence of hypertriglyceridemia and low HDL-cholesterol poses a greater risk for CHD development[4]. Elevated serum triglycerides are commonly associated with insulin resistance and represent a valuable clinical marker of metabolic syndrome i.e., atherogenic dyslipidemia, hypertension, elevated plasma glucose and prothrombotic state further increases the risk of CHD[3]. Thus there is a need to evaluate lipid profile in our Type 2 diabetic population and determine the trends of the major risk factors for CHD. Subsequently this will supplement our physicians in making decision about therapeutic and dietary measures in diabetic population.

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PATIENTS AND METHODS

A total of 95 patients were included in the study, among that 52 were males and 43 females. All patients were already diagnosed with Type 2 diabetes mellitus. Mean age of the patients was determined. Their fasting sample of serum was taken and measured for blood glucose, triglyceride and HDL-cholesterol levels. The serum triglyceride was further categorized into normal and high levels and the HDL-cholesterol was categorized into low and high values. The Triglyceride/HDL-cholesterol ratio was calculated, by dividing the serum triglyceride over HDL-cholesterol levels.

RESULTS

A total of 95 patients, diagnosed with Type 2 diabetes mellitus and fulfilling the inclusion criteria were enrolled in the study. Mean age of the patients calculated was 55.14±1.16. Males were 52 and females were 43 in number. Mean fasting blood glucose was 173.96±39.21. Fasting serum

triglyceride was < 150mg/dL with mean of 137.00±9.90 in patients with mean fasting blood glucose of 149.71±24.23 and it was > 150mg/dL in patients with mean of 219.36±43.74 in patients with mean fasting blood glucose of 178.60±39.91, with p-value of 0.001, that is statistically significant. HDL-cholesterolwas low, mean of 38.38±6.29 with mean fasting blood glucose of 175.76±4.45 and it was high, mean of 48.60±5.22 with mean fasting blood glucose of 173.57±37.73. The p-value was 0.001, statistically significant. The mean TG/HDL-cholesterol ratio was 3.28±0.50 in patients with triglyceride <150mg/dL and was 5.13±1.75 in those with triglyceride of >150mg/dL. The p-value was 0.001, statistically significant. The mean TG/HDL-cholesterol was 5.80±2.7 in patients with low HDL and was 4.2±1.13 in patients with high HDL-cholesterol of mean 48.60±5.29. The p-value was 0.001, statistically significant.

Table 1: Baseline Characteristics of the Diabetic Population

Variables	**Mean ± SD or n (%)**
Age	55.14 ± 11.16
Gender	
Male	53
Female	42
Fasting Blood Sugar	173.96 ± 39.21
HDL Cholesterol	44.51 ± 7.56
HDL categories	
Low HDL	42 (39.6)
High HDL	63 (59.4)
Fasting Triglyceride	206.15 ± 50.41
Triglyceride categories	
TG < 150	17 (16)
TG ≥ 150	89 (84)
TG/HDL ratio	4.85 ± 1.75

Fig. 1: Association (Correlation) of Fasting Triglyceride with HDL Cholesterol

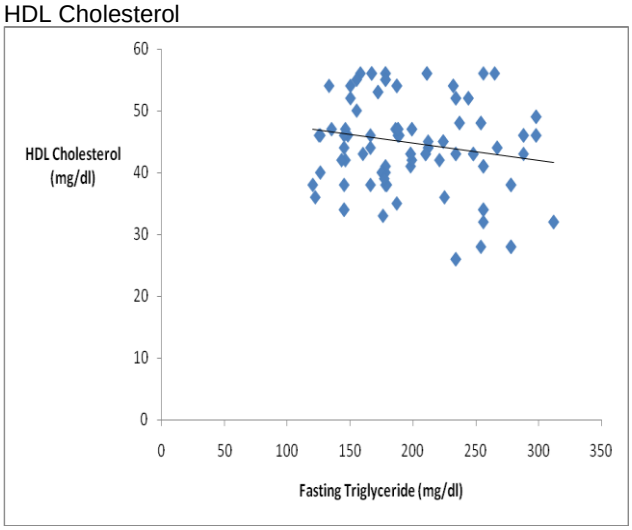


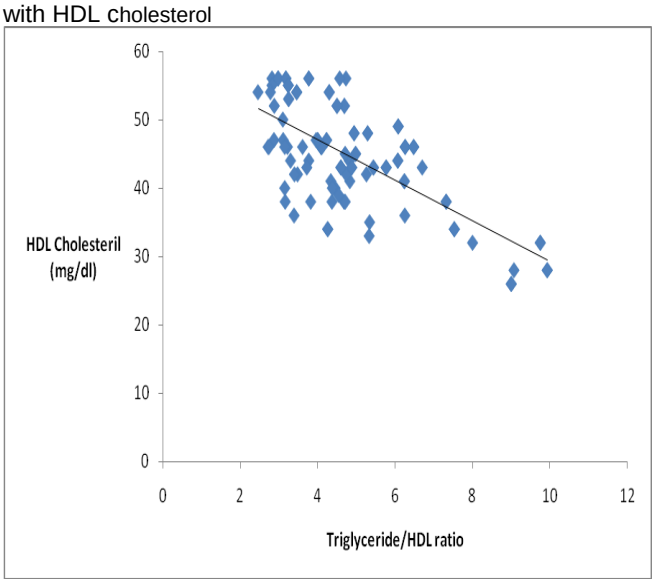
Table 2: Comparison of Mean of biochemical parameters (Fasting Triglyceride, HDL- Cholesterol, and TG/HDL ratio) among Diabetic patients with Low and High HDL.

	Low HDL (Mean ± SD)	**High HDL (Mean±SD)**	**P-value**
Age (Years)	55.6±10.47	55.03±11.66	0.80
Fasting blood sugar	175.76±41.45	173.57±37.73	0.78
Fasting triglyceride	214.14±54.17	201.97±47.09	0.23
HDL-cholesterol	38.38±6.29	48.60±5.22	0.001*
TG/HDL ratio	5.80±2.07	4.21±1.13	0.001*

Table 3: Comparison of Mean of biochemical parameters (Fasting Triglyceride, HDL- Cholesterol, and TG/HDL ratio) among Diabetic patients with Normal and Above Normal Triglyceride.

	TG < 150 (Mean±SD)	**TG ≥ 150 (Mean±SD)**	**P-value**
Age (Years)	49.06±8.39	56.30±11.28	0.013*
Fasting blood sugar	149.71±24.23	178.60±39.91	0.005*
Fasting triglyceride	137.00±9.90	219.36±43.74	0.001*
HDL-cholesterol	42.50±5.53	44.88±7.84	0.249
TG/HDL ratio	3.28±0.50	5.13±1.75	0.001*

Fig.2: Association (Correlation) of Triglyceride/HDL ratio with HDL cholesterol



DISCUSSION

Dyslipidemia is common among Type 2 diabetic patients. Diabetics had significantly raised levels of total cholesterol, LDL cholesterol and triglyceride with significantly lower level of HDL-cholesterol as compared to controls[1]. Raised serum triglyceride and low HDL-cholesterol often precede the onset of Type

2 diabetes for many years[2]. Diabetic dyslipidemia is characterized by elevated triglyceride and low HDL-cholesterol[3]. A total of 100 patients with diabetes mellitus were evauated for lipid profile, out of which 31% had raised triglyceride and 11% had decreased HDL-cholesterol.4 A study published in Pakistan Journal of Pharmacy Jan.2012 edition by Shahid SM et al described diabetes, hypertension and nephropathy with reference to glycemic control, dyslipidemia and endothelial dysfunction indicating the foremost basis of morbidity and mortality worldwide and rapidly progressing in Pakistan. Study revealed significantly high Triglyceride/HDL-cholesterol ratio as compared to controls[5]. Triglyceride levels were raisedin 49% of diabetic patients and 80% had less than normal HDL-cholesterol[6]. Combination of high LDL and a low HDL- cholesterol was the commonest pattern of dyslipidemia found. The triglyceride level in female patients were higher.[7] Insulin resistance is a condition in which cells fail to respond to the normal actions of insulin. Most people with this condition have high level of insulin in their blood. Insulin resistance appears to play an important role in coronary heart disease and can predict mortality. A study in which most of the patients were Caucasians identified Triglyceride/HDL-cholesterol ratio of > 3 as a reliable predictor of insulin resistance. However not all studies have found TG/HDL-cholesterol ratio to be associated with insulin resistance. For example in a relatively small study of 125 African Americans participated neither fasting triglyceride nor the TG/HDL-cholesterol ratio was shown to be a marker of insulin resistance. Although confirmatory studies are needed, data suggests that an elevated TG/HDL-cholesterol ratio may be clinically useful for the prediction of insulin resistance. Hyperinsulinemia is associated with low HDL-cholesterol levels[7,8]. The prevalence of low HDL-cholesterol level in those with diabetes was almost twice as high as the prevalence in non-diabetic individuals[9]. The prevalence of high plasma triglyceride in individuals with diabetes was significantly higher than in those without diabetes[9]. Triglycerides are almost always higher in studies on South Asians compared with those on white Caucasians[10,11,12,13,14]. The majority of studies examining HDL-cholesterol concentration have reported lower levels in South Asian immigrants compared with white Caucasians[10,11,15]. This pattern of dyslipidemia involving raised triglycerides and decreased HDL-cholesterol is typical of the dyslipidemia associated with diabetes and an important characteristic of the metabolic syndrome. The dyslipidemia of the metabolic syndrome, tendency towards low HDL-cholesterol and raised triglyceride i.e., high TG/HDL-c ratio is typical of the lipid profile of many South Asians. It is now believed that the TG/HDL-c ratio is one of the most important predictors of heart disease. In a Harvard lead study, author reported high triglyceride alone increased the risk of heart attack nearly threefold and people with the highest ratio of TG/HDL-c had 16 times the risk of heart attack as those with the lowest ratio of triglyceride to HDL-c. In the study of 340 heart attack patients and 340 of the healthy same age counter-parts the TG/HDL-c ratio was the strongest predictor of heart attack, even more accurate than the LDL/HDL ratio[16]. Nearly all routinely assessed lipid variables were associated with the extent of coronary disease but only the ratio of TG/HDL-c were robustly associated with the disease extent. Elevation in ratio of TG/HDL-c was the single most powerful predictor of coronary heart disease among all the lipid variables examined[17] The importance of TG/HDL-c can be seen from the recently published results of the ongoing Copenhagen male study, which studied the effect this ratio has on the long-term development of heart disease. The researcher compared healthy patients who had low TG/HDL-c ratio, <1.7 with patients with TG/HDL-c, >6. They were amazed to find that patients with low TG/HDL-c had a lower risk of developing heart disease than those who had a high TG/HDL-c. Our study revealed that TG/HDL-c was high in patients with high triglyceride and low HDL-c levels in patients with elevated blood glucose, in Type 2 diabetes. This is in concordance to many international studies carried out. The need is to educate patients with Type 2 diabetes that they should regularly get their fasting lipids checked. The physicians must calculate the TG/HDL-c ratio in each case and advise not only medications to decrease the ratio but also encourage patients to exercise regularly.

CONCLUSION

Elevation in the ratio of Triglyceride to HDL-cholesterol is the most powerful predictor of heart disease in Type 2 diabetes mellitus.

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