



## PARAMETERS OF LIPID METABOLISM AND THEIR RELATIONS WITH GLYCEMIC CONTROL IN TYPE 2 DIABETIC PATIENTS

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### ABSTRACT

Type 2 diabetes mellitus is associated with the development of premature atherosclerosis and a higher cardiovascular and cerebrovascular morbidity and mortality (1). Hyperglycemia and diabetic dyslipidemia are believed to play an important role in the pathogenesis of accelerated atherosclerosis.

The aim of our study was to examine the relation of glycemic control / HbA1C as a marker/ with lipids parameters of diabetic patients. 192 type 2 diabetics from the region of Stara Zagora, Bulgaria were included in this study. Subjects were divided in two groups: HbA1c < 7% as a good, HbA1c > 7% as a worse glycemic control. We came to the conclusion that the levels of serum cholesterol and triglycerides were significantly higher in patients with worse glycemic control as compared to patients with good glycaemic control. We may conclude that dyslipidemia is often associated with elevated HbA1c in type 2 diabetic patients and should be treated simultaneously.

**Key words:** Diabetes Mellitus Type 2, Lipid Metabolism, Glycemic Control.

### INTRODUCTION

Type 2 diabetes mellitus (DM) is a heterogeneous disease characterized by the presence of both impaired insulin secretion and insulin resistance. Type 2 DM is associated with the development of premature atherosclerosis /macrovascular complications/ and a higher cardiovascular and cerebrovascular morbidity and mortality. Diabetic hyperlipidemia is believed to play an important role in the pathogenesis of accelerated atherosclerosis. Dyslipidemia in type 2 DM include elevated triglyceride levels, decreased HDL cholesterol and increased levels of small dense LDL cholesterol. Elevated HbA1C and dyslipidemia are independent risk factors for cardiovascular diseases. Although they have been shown to be independent significant risk factors for vascular complications, the interaction of hyperglycemia and dyslipidemia increases the risk of macro and micro-vascular complications together.

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Glycemic control, control of blood pressure and lipid levels are important in the prevention or delay in onset and severity of diabetes complications. In previous studies researchers discovered a connection between glycemic control and some parameters of lipid profile, but correlations are different and not completely clear. (2, 3, 4)

**Aim:** The aim of our study was to examine the relation of glycemic control / HbA1C as a marker/ with lipids parameters of diabetic patients.

### PATIENTS AND METHODS

192 type 2 diabetic patients (males 90; females 102) from region of Stara Zagora, Bulgaria were included in this study. Venous blood samples were collected from all the subjects after at least 8 h fasting. The samples were analysed for HbA1c, total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL) and low-density lipoprotein cholesterol (LDL). LDL/HDL and risk ratio (TC/HDL) were calculated. (Table 1, 2)

**Table 1.**

	men (n=90)	women (n=105)	P
	Mean ±SEM	Mean ±SEM	
Chol	5.26±0.15	5.63±0.14	0.066
TG	2.66±0.19	2.39±0.13	0.230
HDL	1.21±0.04	1.30±0.04	0.105
LDL	2.77±0.14	3.15±0.15	0.063
HbA1C	9.88±0.25	10.27±0.24	0.279
Risk ratio	4.59±0.16	4.57±0.13	0.930
LDL/HDL	2.68±0.14	2.65±0.12	0.872

We divided the subjects based on their glycemic control into two groups; HbA1c < 7% as good, HbA1c > 7% as worse glycemic control. Data are presented as mean ± standard error of mean (S.E.M.) Statistical analysis was performed with R 3.1.0. /5/ Two tale value of P < 0.05 was considered statistically significant for all analyses.

## RESULTS

The levels of serum cholesterol and TG were significantly higher in patients with worse

glycaemic control as compared to patients with good glycaemic control (**Table 2**). HbA1c showed direct and significant correlations with serum cholesterol (p = 0.008) and TG levels (p = 0.010). LDL cholesterol, risk ratio / TC/HDL/ and LDL/HDL tended to be higher in patients with HbA1c > 7% but not statistically significant. There is no difference in glycemic control between man and women. TC and LDL are with tendence to be higher in women and TG in men. (**Table 1**)

**Table 2.**

	HbA1c ≤ (n=20)	HbA1c > (n=172)	P
	Mean ±SEM	Mean ±SEM	
Chol	4.77±0.24	5.53±0.11	0.008*
TG	1.93±0.21	2.59±0.12	0.010*
HDL	1.19±0.09	1.27±0.03	0.419
LDL	2.66±0.22	3.06±0.12	0.111
Risk ratio	4.22±0.24	4.63±0.11	0.127
LDL/HDL	2.45±0.17	2.71±0.11	0.201

## DISCUSSION

A high prevalence of dyslipidemia is well recognized in type 2 DM. Approximately 77.5% of type 2 diabetic patients exhibit dyslipidemias. Although the dyslipidemias in T2DM, particularly hypertriglyceridemia, are exacerbated by poor glycemic control, lipid abnormalities cannot be explained merely by hyperglycemia. The main cause of diabetic dyslipidemia is the increased free fatty acid release from insulin resistant fat cells. The increased influx of free fatty acids into the liver in the presence of adequate glycogen stores promotes TG production, which in turn stimulates the secretion of apolipoprotein B and VLDL cholesterol. The impaired ability of

insulin to inhibit free fatty acid release leads to enhanced hepatic VLDL production. The most common dyslipidemia in individuals with T2DM is increased TG levels. Lipoprotein lipase (LPL) plays a central role in TG metabolism. LPL, if defective, could predispose to hypertriglyceridemia (5). The main disorder in lipid metabolism in our study were hypercholesterolemia and hypertriglyceridemia, which are significantly higher among patients with worse glycemic control. Momin AA and all. (2) found significantly higher total cholesterol/TC/, LDL cholesterol, TC/HDL cholesterol but not trygliceride in diabetic type 2 patients with worst glycemic control / HbA1C > 7%/, whyle Khan HA (3) found no significant

difference in LDL cholesterol. A recent study suggests a complex genetic regulation and metabolic interplay between lipids and plasma glucose. (6) Disorders in genetic regulation of lipid and carbohydrate metabolism and differences between patterns of life, eating habits in studied populations may explain variabilities in correlations between glycemic control and lipid parameters.

### CONCLUSION

Dyslipidemia is associated with high HbA1C, but correlation of different parameters of lipid profile probably depends from genetic fond of population and differences specifically for various regions' patterns of life.

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