

EFFECT OF GLYCEMIC CONTROL ON DIABETIC DYSLIPIDEMIA

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ABSTRACT

Objective: To determine whether good glycemic control has an effect on lipid profile in diabetics

Study Design: Cross-sectional study

Place and duration of study: Department of Medicine, Combined Military Hospital Lahore; June to December 2007.

Patients and methods: After taking relevant history and physical examination, serum urea, creatinine, thyroid stimulating hormone, bilirubin, alanine transaminase and HbA1c were measured. Blood samples for determination of fasting plasma glucose, serum total cholesterol, triglycerides, HDL and LDL levels were collected in a fasting state. Patients were divided into two groups based on HbA1c levels. They were compared using SPSS 13.

Results: 42 patients had good glycemic control and 58 had poor control. The two groups were age and weight matched. 43 patients had abnormal lipid profiles. Serum total cholesterol and triglycerides were lower and HDL levels higher in the good control group but serum LDL levels were equal.

Conclusion: Good glycemic control improves lipid profile in patients with type 2 diabetes mellitus.

Keywords: Diabetes mellitus, dyslipidemia, triglycerides

INTRODUCTION

Diabetes mellitus type 2 has a profound impact on individuals and the society, with its devastating complications taking a huge toll in terms of morbidity and mortality. Compared with nondiabetic individuals, patients with type 2 diabetes have a two- to fourfold higher risk of cardiovascular disease, and dyslipidemia is an important contributor to the increased risk in this population [1]. The dyslipidemia associated with insulin resistance and type 2 diabetes is characterized by elevated triglycerides and decreased high density lipoprotein cholesterol (HDL) [2]. Although low density lipoprotein cholesterol (LDL) may not be elevated in type 2 diabetes, an increase in the proportion of small, dense, and potentially more atherogenic LDL cholesterol particles is observed [3]. Insulin resistance is regarded as a major driving force for dyslipidemia, with one mechanism being an increase in free fatty acid release, stimulating hepatic triglyceride output [4].

The control of blood lipids is one of the cornerstones in the treatment of diabetes. Apart from effects on macrovascular outcomes [5], dyslipidemia potentially contributes to microvascular disease [6]. Despite the common occurrence of dyslipidemia in patients with diabetes, the consequent high risk for coronary heart disease, and well-publicized treatment guidelines, elevated cholesterol levels remain under treated in this population.

Objective: To determine whether good glycemic control has an effect on lipid profile in diabetics

PATIENTS AND METHODS

This cross-sectional study was carried out at Department of Medicine, Combined Military Hospital Lahore from June to December 2007. A total of 100 patients above the age of 18, already on treatment for diabetes mellitus type 2, were enrolled from medical outdoor clinics after obtaining informed consent. Following patients were excluded: unwilling patients; patients on lipid lowering drugs, or other agents that interfere with lipid metabolism, including oral contraceptives, steroids, beta blockers, diuretics; and, patients with secondary causes of dyslipidemias including nephrotic syndrome

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/chronic kidney disease, liver failure, hypothyroidism, gall stones.

A detailed history was taken and physical examination done to look for the above mentioned excluding criteria and to find any xanthomas/ xanthelasmas. Serum urea, creatinine, thyroid stimulating hormone, bilirubin, alanine transaminase and HbA1c were measured. Patients were called again after 14 hours overnight fast and blood samples collected for determination of fasting plasma glucose, serum total cholesterol, triglycerides, HDL and LDL levels.

Data was analyzed using SPSS 13. For this purpose, patients were divided into two groups based on long term glycemic control: those with good control reflected by HbA1c levels $\leq 7\%$ and those with poor control having HbA1c $> 7\%$. Data was described as mean \pm standard deviation.

RESULTS

Out of the 100 patients included in this study, 58% were males and the rest (42%) females. Their mean age was 52.56 ± 11.70 years. 43.1% males (n: 25) smoked in contrast to none of the females. The first group comprised of 42 patients who had good glycemic control. In the second group, there were 58 patients with poor glycemic control. Patients in the two groups did not differ with respect to age, weight and gender distribution. The clinical and biochemical profile of all the patients is depicted in table. Serum total cholesterol levels and triglycerides were significantly lower and HDL levels higher in patients with good glycemic control. However, patients in the two groups had no significant difference in serum LDL levels. Amongst the 100 patients included in the study, 43 had different lipid

parameters that were out of normal range; out of these, 9 (21%) were from the good control group and 34 (59%) from the poor control group. Nineteen patients had elevated total cholesterol levels only; remaining 24 had different combinations of abnormal lipid fractions as illustrated in Fig 1 and Fig 2.

DISCUSSION

As in nondiabetic individuals, lipid levels may be affected by factors unrelated to glycemia or insulin resistance, such as renal disease, hypothyroidism or liver disease. The use of alcohol and estrogens may also contribute to hypertriglyceridemia. Such patients were excluded from this study. Weight loss can also independently affected triglyceride levels [7]; this, however, was not a confounding factor in our study because the two groups did not differ from each other in terms of weight.

Though a study done in Pakistan reported raised levels of LDL as the main finding [8], we found that triglycerides were most frequently raised as observed in many local as well as international studies [9, 10].

Although glycemic control is the cornerstone of diabetes therapy, this study suggests that this intervention alone might not play a significant role in improving LDL cholesterol. Similar finding was noted in a study by Erdman et al [7]. The decline in LDL cholesterol seen in diabetics not on lipid lowering drugs may be attributable to other management elements such as lifestyle modification (changes in diet composition and/or physical activity). Lifestyle modification must continually be emphasized and reinforced in overall diabetes care. Nevertheless, our results indicate that patients with elevated LDL

Table-1: Clinical and biochemical profile of the study population

Parameter	Good Control Group	Poor Control Group	P-Value	Total
Age (years)	53.60 \pm 11.48	51.81 \pm 11.90	0.454	52.56 \pm 11.70
Weight (kg)	70.40 \pm 7.58	68.26 \pm 9.33	0.223	69.16 \pm 8.66
Systolic BP (mmHg)	135.00 \pm 18.71	137.07 \pm 21.15	0.614	136.20 \pm 20.09
Diastolic BP (mmHg)	85.24 \pm 10.00	85.95 \pm 12.01	0.775	85.65 \pm 11.16
Fasting Plasma Glucose (mmol/l)	6.22 \pm 1.37	10.58 \pm 3.24	0.000	8.73 \pm 3.38
HbA1c (%)	6.69 \pm 0.346	9.10 \pm 1.73	-	8.09 \pm 1.79
Total Cholesterol (mmol/l)	4.99 \pm 0.41	5.29 \pm 0.52	0.003	5.16 \pm 0.49
Triglycerides (mmol/l)	1.98 \pm 0.27	2.18 \pm 0.33	0.002	2.09 \pm 0.32
HDL (mmol/l)	1.12 \pm 0.23	1.04 \pm 0.16	0.032	1.08 \pm 0.20
LDL (mmol/l)	2.95 \pm 0.21	2.96 \pm 0.32	0.809	2.96 \pm 0.28

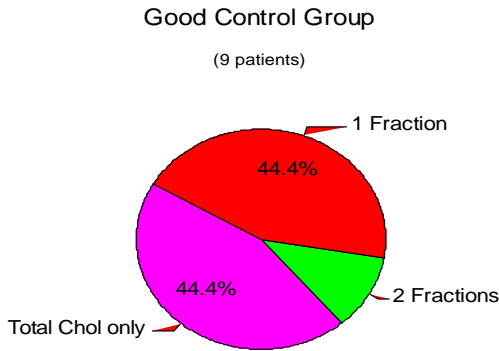


Fig.1: Frequency of patients with different combinations of abnormal lipid fraction in good glycemic control group (n=9)

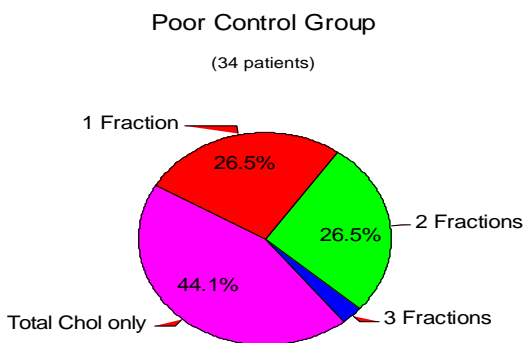


Fig.2: Proportion of patients with different combinations of abnormal lipid fractions in poor glycemic control group (n=34)

cholesterol concentrations need early introduction of lipid lowering agents into their treatment plans rather than wait a long period for possibly ineffective nonpharmacologic approaches.

There are a couple of limitations to our study. Because this analysis was based on a clinic population, data from other hospitals are required to determine whether our findings can be generalized to other diabetes care settings. Secondly, because we did not collect data on exercise or dietary habits, we are unable to retrospectively assess the effects of these interventions on lipid profiles. Thirdly, amongst the hypoglycemic agents, pioglitazone can directly increase HDL levels and decrease triglycerides [11]. We do not know how many

patients in either group were taking pioglitazone and what effects such therapy had on the results.

CONCLUSION

Good glycemic control favourably affects lipid profile. To attain acceptable lipid parameters in diabetics, all efforts should be made to achieve near euglycemia through life style modifications and drugs. However, statins should be introduced early in patients with raised LDL levels since this fraction is not reduced by good glycemic control alone.

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