e-ISSN: 2319-9865
p-ISSN: 2322-0104
Research and Reviews: Journal of Medical and Health Sciences

Comparison of Lipid Profile between Controlled and Uncontrolled Type - 2 Diabetic Subjects.

Preha Singh, Veerendra Kumar Arumalla*, and Balaji Rajagopalan

Department of Biochemistry, Shri Sathya Sai Medical College and Research Institute, Ammapettai, Nellikuppam, Kancheepuram (Dist), Tamil Nadu - 603108, India.

Research Article

Received: 20/08/2013
Revised : 02/09/2013
Accepted: 10/09/2013

***For Correspondence**

Shri Sathya Sai Medical College and Research Institute, Ammapettai, Nellikuppam, Kancheepuram(Dist), Tamil Nadu-603108, India.

Keywords: Diabetes, Glycated haemoglobin, blood glucose levels.

ABSTRACT

Diabetic patients with accompanied (but often unnoticed) dyslipidemia are soft targets of cardiovascular deaths. An early intervention to normalize circulating lipids shown to reduce cardiovascular complications and mortality. Glycated hemoglobin (HbA1c) is a routinely used marker for long term glycemic control. In the present study we have compared the lipid profiles between controlled diabetic subjects (HbA1c < 7%), moderately controlled (HbA1c > 7% and ≤ 9%) and Uncontrolled diabetic subjects (HbA1c >9%). We found that blood glucose levels and lipid profile parameters (except HDL) were increased significantly in uncontrolled diabetics and moderately controlled diabetics when compared to controlled diabetics.

INTRODUCTION

Diabetes mellitus is a group of metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Diabetes causes about 5% of all deaths globally each year. The chronic hyperglycemia of diabetes is associated with long term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels. 50% of people with diabetes die of cardiovascular disease (CVD) (primarily heart disease and stroke) [1,2]. Low density Lipoprotein (LDL) is considered as an independent risk factor for the development of CVD [3]. The risk for CVD is higher in Diabetic subjects than non-diabetic subjects [4]. Glycated hemoglobin (HbA1c) is a routinely used marker for long term glycemic control. HbA1c has been proposed as a dual marker for glycemic control and CVD risk factor [5]. The clinical importance of glycemic control in Type-2 diabetic patients was well established in the United Kingdom prospective Diabetic Study (UKPDS) [6]. The American Diabetic Association estimates that the risk of diabetes related mortality increases 25% for each 1% increase in HbA1c [7]. Estimated risk of CVD has shown to be increased by 18% for each 1% increase in absolute HbA1c value in the diabetic population [8]. So reduction or control of blood glucose level may lower the risk for CVD. We aimed to compare the lipid profiles with special attention to LDL Cholesterol between Uncontrolled (HbA1c >9%), moderately controlled (HbA1c > 7% and ≤ 9%) and controlled diabetic subjects (HbA1c < 7%) [9].

The objectives of the present study are

1. To estimate Fasting Blood Glucose, Postprandial Blood Glucose, HbA1c, and Lipid profiles in controlled and uncontrolled diabetic subjects.

2. To compare the lipid profiles with special attention to LDL Cholesterol between controlled diabetic subjects (HbA1c < 7%), moderately controlled (HbA1c > 7% and ≤ 9%) and Uncontrolled diabetic subjects (HbA1c >9%).

MATERIALS AND METHODS

A cross sectional study will be conducted involving a total of 150 subjects aged 40-60 years of both sexes who were fulfilling the WHO diagnostic criteria for Type-2 DM will be included in the study. Diabetic patients will be classified into 3 groups with 50 subjects in each group as per their glycemic index. Group 1-controlled diabetic

e-ISSN: 2319-9865
p-ISSN: 2322-0104
subjects (HbA1c < 7%), group-2 moderately controlled (HbA1c > 7% and ≤ 9%) and group-3, uncontrolled (HbA1c >9%).

Exclusion Criteria:

1. Patients with thyroid disorders
2. Patients with hepatic impairment
3. Patients with CVD
4. Patients with Renal failure
5. Patients with H/O smoking and Alcoholism

TSH, Sr Bilirubin, SGOT, SGPT, Sr Creatinine, Blood Urea will be estimated in all patients to exlude the above mentioned conditions.

After obtaining the informed consent Venous blood samples will be collected from all the subjects after at least 8 hours fasting. The Serum will be later used for analyzing Fasting Blood Sugar (FBS), HbA1c, Lipid Profile -Serum Total cholesterol (TC), HDL-cholesterol (HDL-C), Triacylglycerol (TAG) and LDL-cholesterol. Parameters will be assayed by the following methods

Parameter	Method
1. FBS/ PPBS	Glucose oxidase peroxidase
2. Serum Total Cholesterol	CHOD-PAP method
3. Serum triglycerides	GPO- Trinder method
4. HDL Cholesterol	CHOD-PAP method
5. Hb A_1 C	Ion exchange resin method
6. LDL cholesterol will be calculated by Friedwald's formula.	

All the parameters will be assessed in all the 3 groups and will be compared.

***Statistical analysis*:**

The data will be evaluated by SPSS statistical package version 17.0. Independent samples t-test (2-tailed) will be used to compare means of different parameters in males and females. The ANOVA test will be used to compare to compare the means of different parameters in the 3 groups. Value of HbA1c will be given as a percentage of total hemoglobin and values of all other parameters will be given in mg/dl. All Values will be expressed as mean ± standard deviation of the mean. P value < 0.05 will be considered as significant.

OBSERVATIONS AND RESULTS

The present study included a total of 150 subjects out of which 90 were males and 60 females. The mean age of the male subjects was 50.50±6.08 years and that of females was 50.56±6.43 years. Difference in the age between male and female subjects was not significant. FBS, PPBS and HbA_{1c} values were more in female patients when compared to the male patients. But the difference in the mean values was not statistically significant. All the circulating lipid values were more in females when compared to males. But the difference in the mean values was not statistically significant (table 1).

Table 1: Gender wise distribution of blood glucose, lipid profile and HbA_{1c}

	Male	Female	p- Value
Age	50.50±6.08	50.56±6.43	0.953
FBS	163.02±75.85	175.41±82.07	0.346
PPBS	246.39±115.78	266.61±127.85	0.318
Hb A_{1c}	8.21±2.16	8.44±2.34	0.552
T.Chol	218.23±39.06	223.38±37.63	0.425
TGL	172.89±74.01	186.06±81.40	0.308
HDL	46.58±19.06	43.55±16.43	0.316
LDL	137.20±40.32	142.10±39.40	0.464
VLDL	34.56±14.86	37.25±16.26	0.299

P value < 0.05 was considered as significant

When the comparison was made between the different Hb A_{1c} Groups, FBS,PPBS and Hb A_{1c} values were significantly increased in group 2 and group 3 when compared to group 1 patients (P value 0.000).All the lipid

profile parameters except HDL were increased significantly in group 2 and group 3 when compared to the group 1 patients (P value 0.000). There was significant difference in all these parameters within the three groups (table 2).

Table 2: Comparison of blood glucose, lipid profile in different Hb A_{1c} Groups

Parameter	Group 1	Group 2	Group 3	P-Values
FBS	97.70± 15.75	153.44 ± 37.09	252.46 ± 66.38	0.000*,0.000#, 0.000$
PPBS	136.80± 29.30	242.84±50.46	383.56±96.91	0.000*,0.000#, 0.000$
Hb A_{1c}	6.07±0. 46	7.80±0. 51	11.02±1.33	0.000*,0.000#, 0.000$
T.Chol	184.54±23.45	222.26±30.71	254.26±22.07	0.000*,0.000#, 0.000$
TGL	106.08±38.01	174.54±52.82	254.06±50.16	0.000*,0.000#, 0.000$
HDL	60.94±15.52	46.50±12.26	28.58±7.56	0.000*,0.000#, 0.000$
LDL	101.98±25.89	140.90±26.77	174.84±26.64	0.000*,0.000#, 0.000$
VLDL	21.24±7.79	34.86±10.54	50.84±10.03	0.000*,0.000#, 0.000$

*Gorup 1 Vs Group 2, # Group 1 Vs Group 3, $ Group 2 Vs Group 3

Distribution of LDL Cholesterol in different Hb A_{1c} Groups was shown in table 3. It is observed that 90% of the group 3 patients were having LDL cholesterol > 150 mg/dl, where as it was 34% and 04% only in group 2 and group 1 patients.

Table 3: Distribution of LDL Cholesterol in different Hb A_{1c} Groups

	Up to 100mg/dl	101 to 130 mg/dl	131 to 150 mg/dl	>150 mg/dl
Group 1	50%	36%	10%	04%
Group 2	12%	08%	46%	34%
Group 3	04%	00%	06%	90%

In the present study blood glucose levels and lipid profile parameters (except HDL) were found to be increased significantly in uncontrolled diabetics and moderately controlled diabetics when compared to controlled diabetics.

These finding were inaccordance with a study conducted by Ahmed I et'al [10] which concluded that individuals with good glycemic control (HbA1c <7 %) had statistically significant differences in the values of total cholesterol, triglycerides and VLDL as compared to individuals with poor glycemic control. Another study conducted by Amer W et al [11] showed that all lipid fractions were deranged in patients with uncontrolled type 2 DM.

In our study lipid parameters were found to be more in females when compared to males. This observation was in accordance with the study conducted by Wexler et al [12] who reported that mean values of TC and LDL-C were significantly higher in females as compared to males.

Type 2 DM is associated with a marked increase in the risk of Coronary heart disease (CHD) and dyslipidemia is believed to be a major cause of increased risk [13]. In newly diagnosed and established diabetics correlation was found between HbA1c levels and carotid intima-media thickness [14].

The oxidation of lipoproteins, in particular LDL-C, seems to be increased in diabetic patients, especially those with poor glucose control, hypertriglyceridemia, and microvascular and macrovascular disease. Oxidation of LDL-C results in a moiety that is cytotoxic to vascular endothelial and smooth muscle cells, contributing to atherogenesis [15].

CONCLUSION

In our study elevated total serum cholesterol,Triglyceride, LDL-C and low HDL-C were observed in type 2 diabetics with poor glycemic control compared to patients with good glycemic control. The glycemic control of the patient has got a strong impact on the serum lipid level and dyslipidemia is frequently encountered in those who have got poor glycemic control. Patients should be educated about regular monitoring of lipid profiles and if found to be abnormal, should control blood sugar and lipids very effectively.

ACKNOWLEDGEMENT

The authors would like to thank the Faculty of the Department of General Medicine Shri Sathya Sai Medical College and Clinical Biochemistry Laboratory, for their help in the study. The study was ICMR STS-2012 project (Reference ID: 2012-02077), we are grateful to the ICMR for funding the student project.

e-ISSN: 2319-9865
p-ISSN: 2322-0104

REFERENCES

1. Diabtes.http://.who.int/mediacentre/factsheets/fs312/en/ index.html (Updated on November 2009).
2. Glycosylaed Haemoglobin, HbA1C.hptt:// clinlabnavi-gator.com/test interpretations/haemoglobin-a1c.html?letter=h (Updated on 18 June 2010).
3. Expert panel on Detection, evaluation, and Treatment of High blood cholesterol in adults. Executive summary of the third report of the national Cholesterol Education Program (NCEP) expert panel on detection, evaluation, and treatment of High blood cholesterol in adults (Adult Treatment Panel III). JAMA. 2001; 285: 2486-97.
4. Sowers JR and Lester MA, Diabetes and cardiovascular disease. Diabetes care. 1999; 22(Suppl.3) C: 14-20.
5. Khan HA, Clinical significance of HbA1C as a marker of circulating lipids in male and female type-2 diabetic patients. Acta Diabetol. 2007; 44: 193-200.
6. UKPDS group. Intensive blood glucose control with sulfonylureas and insulin compared with conventional treatment and risk of complications in patients with type-2 diabetes. Lancet 1998;352: 837-853.
7. American Diabetic Association. Implications of United Kingdom prospective Diabetes Study. Diabetes Care, 2003; 26 (Suppl.1): S 28-S32.
8. Selvin E, Marinopoulos S, Berkenblit G, Rami T, Brancati FL, Powe NR, et al. Meta-analysis: glycosylated hemoglobin and cardiovascular disease in diabetes mellitus. Ann Intern Med. 2004; 14: 421-431.
9. American Diabetic Association. Standards of medical care in diabetes. Diabetes Care. 2004; 27 (Suppl.1): S 15-S35.
10. Ahmed I, Qamar R, Masroor M, Sattar A, Imran K. Effect of glycemic control on lipid profile in Diabetics. Med Channel. 2005; 10: 44-7.
11. Amer W, Zafar S, Majrooh A. Comparison of dyslipidemias in controlled and uncontrolled type 2 diabetics. Ann King Edward Med Coll. 2004; 10:158-60.
12. Wexler D J, Grant R W, Meigs J B, Nathan D M, Cagliero E. Sex disparities in treatment of cardiac risk factors in patients with type 2 diabetes. Diabetes Care. 2005; 28: 514-20.
13. Naheed T, Khan A, Masood G, Yunus B, Chaudhry MA. Dyslipidemias Diabetes Mellitus patients in a teaching hospital of Lahore. Pak J Med Sci. 2005; 19: 283-6.
14. Selvin E, Coresh J,Golden SH, Boland LL, Brancati FL, Steffes MW. Glycemic control, atherosclerosis, and risk factors for cardiovascular disease in individuals with diabetes: the atherosclerosis risk in communities study. Diabetes Care. 2005; 28: 1965-73.
15. Rosenson RS. Statins in atherosclerosis: lipid lowering agents with antioxidant capabilities. Atherosclerosis. 2006; 173: 1-12.