Original Research Article

Study of Lipids and Lipoprotein Levels in uncomplicated Diabetes Mellitus Patients attending Shadan Hospital

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ABSTRACT

Background: Lipid and lipoprotein levels are interrelated with diabetes mellitus. Abnormalities in the levels of total cholesterol (TC) or triglycerides (TAG) or low-density lipoprotein (LDL) cholesterol or very-low-density lipoprotein (VLDL) cholesterol or high-density lipoprotein (HDL) cholesterol or lipoprotein (a) [Lp (a)] is traditionally named as dyslipidemia. Diabetes mellitus has been known to be associated with lipid disorders and cardiovascular diseases. In patients with diabetes mellitus, dyslipidemia occurs earlier in life, leading to increased morbidity and mortality rates. The study aims to assess the changes in lipids and lipoprotein levels in uncomplicated diabetes mellitus patients.

Methods: A case-control type of study was conducted for 18 months (September 2011 to March 2013) at the Department of General Medicine, Shadan Hospital, Hyderabad. Ethical committee approval was taken before the study from the institutional ethical committee. A total of 120 subjects, 60 non-diabetic (healthy) control subjects with matching age and gender and, 60 cases of subjects with uncomplicated diabetes mellitus were enrolled based on predetermined inclusion and exclusion criteria.

Results: This study was conducted to evaluate the changes in lipids and lipoprotein levels between control (normal and healthy subjects) and case (subjects with uncomplicated diabetes mellitus) groups. The Mean±SD levels of total cholesterol, triglycerides, low-density lipoprotein cholesterol, very-low-density lipoprotein cholesterol, and lipoprotein (a) were higher in the cases group and showed statistical significance when compared with the control group.

Conclusions: Our study states that there are abnormal levels of lipids and lipoprotein in

subjects with uncomplicated diabetes mellitus, which is the foremost cause of cardiovascular diseases, coronary heart disease, dyslipidemia, etc.

Keywords: HDL, LDL, Lipid, Lipoprotein, Lp(a), TAG, TC, Uncomplicated diabetes mellitus.

INTRODUCTION

The rising prevalence of diabetes mellitus poses vast health challenges worldwide and represents a significant burden of disease for communities across all nations. Latest figures from the World Health Organization estimate that 463 million adults were living with diabetes in 2019, rising to 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045.[1] Diabetes mellitus is a worldwide public health problem, specifically among the elderly. Diabetic patients are at high risk for dyslipidemia, cardiovascular diseases, coronary heart disease, and mortality.[2] Diabetes mellitus and dyslipidemia constitute major independent and risk factors of coronary heart disease.[3]

The prevalence of dyslipidemia in diabetes mellitus patients is 95%.[4] Early detection and treatment of hyperlipidemia in diabetic patients decreases the risk for cardiovascular complications. Dyslipidemia associated with diabetes mellitus is characterized by hypertriglyceridemia, increase in LDL, increase in VLDLand decrease in HDL.[5]

Lipoproteins transport cholesterol and triglycerides in the blood. Lipoprotein (a) is a cholesterol-rich lipoprotein. Epidemiological evidence indicates that lipoprotein (a) is associated with the risk of cardiovascular diseases.[6]

The purpose of the present study was to assess the changes in lipids and lipoprotein levels in uncomplicated diabetes mellitus patients.

METHODS

A case-control type of study was conducted for 18 months (September 2011- march 2013) at the Department of General Medicine, Shadan Hospital, Hyderabad. Ethical committee approval was taken before the study from the institutional ethical committee. The study comprised of subjects of either gender, aged between 30- 60 years. Following the inclusion and exclusion criteria, the following groups were formed.

Group allocation

120 subjects were divided into two groups of 60 subjects each. a) Control group (n=60): healthy males and females matched for age and gender. b) Case group (n=60): cases of diabetes mellitus without complications.

Diabetic profile, lipids, and lipoprotein levels were taken as per WHO (World Health Organization) and NCEP ATP III (National Cholesterol Education Program) (adult treatment

panel III) guidelines, respectively.

Diabetic profile as per WHO guidelines[7]
1) FBS: ≥126 mg/dl, 2) PPBS: >200 mg/dl, 3) HbA1c: ≥6mg/dl.

Lipid profile (dyslipidemia) as per NCEP ATP III guidelines[8]

1) Total cholesterol: >200 mg/dl, 2) Triglyceride: >150 mg/dl, 3) LDL: >100 mg/dl, 4) VLDL: >30 mg/dl, 5) HDL: <40 mg/dl males and <50 mg/dl (females), 6) Lipoprotein (a): ≥30 mg/dl.

Statistical analysis
Data was analysed using SPSS software. Data were expressed as mean±SD and p value <0.05 was consideredstatistically significant.

RESULTS

A total of 120 subjects participated. 60 from the control group and 60 from the case group, respectively. The present study was conducted to evaluate the changes in lipids and lipoprotein levels between control (normal and healthy subjects) and case (subjects with uncomplicated diabetes mellitus) groups.

The subjects aged below 30 years and above 60 years, alcoholics, smokers, and the subjects suffering from obstructive jaundice, hypothyroidism, hypopituitarism, epilepsy, psychiatric complaints, and nephrotic syndromewere excluded from the study, to avoid the influence of these disorders on lipids and lipoprotein levels.

Table 1: Demographic and clinical characteristics ofcontrol and cases subjects.

Parameters	Controls (n=60)	Cases (n=60)
Age (30-60 years)	1.62±0.846	2.22±0.804
Gender (male/female)	36/24	23/37
FBS levels	1.25±0.600	2.87±0.468
PPBS levels	1.23±0.563	2.78±0.555
HbA1c levels	1.67±0.837	2.35±0.606

Data represented as Mean±SD; FBS= fasting blood sugar, PPBS= postprandial blood sugar, HbA1c=Glycated haemoglobin

The average age of control and case group subjects was 1.62±0.846 and 2.22±0.804, respectively, ranging between 30-60 years. Among control group subjects 36 were males whereas 24 were females and among the case group subjects, 23 were males whereas 37 were females (Table 1).

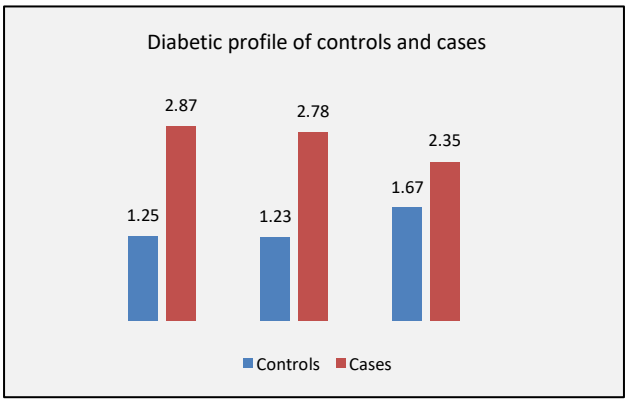

Figure 1: Diabetic profile of control and cases subjects.

The diabetic profile of control and case group subjects was compared, a marginal increase in the cases group (FBS-2.87±0.468, PPBS-2.78±0.555, and HbA1c-2.35±0.606) was observed when compared to the control group (FBS- 1.25±0.600, PPBS- 1.23±0.563, and HbA1c-1.67±0.837) (Figure 1).

Table 2 depicts the comparison of lipids and lipoprotein levels in control and case subjects. It was noticed that TC, TAG, LDL, VLDL, and Lp(a) in case group subjects were 2.63±0.901, 2.07±0.954, 2.35±0.899, 2.17±0.960, and 2.45±0.852, respectively. And in control group subjects were 1.27±0.634, 1.52±0.792, 1.93±0.972, 1.52±0.792, and 1.22±0.555, respectively.

Table 2: Comparison of lipids and lipoprotein levels incontrol and cases subjects.

Parameters	Controls(n=60)	Cases (n=60)	P value
TC	1.27±0.634	2.63±0.901	p<0.05
TAG	1.52±0.792	2.07±0.954	p<0.05
LDL	1.93±0.972	2.35±0.899	p<0.05
VLDL	1.52±0.792	2.17±0.960	p<0.05
HDL	2.05±0.946	1.90±0.951	p>0.05
Lp (a)	1.22±0.555	2.45±0.852	p<0.05

Data represented as mean±SD; total cholesterol (TC), triglycerides (TAG), low-density lipoprotein (LDL), very- low-density lipoprotein (VLDL), high-density lipoprotein (HDL), lipoprotein a (Lp a)

This determines that levels of TC, TAG, LDL, VLDL, and Lp(a) in case group subjects were increased as compared to control group subjects, which is statistically significant (p<0.05).

The HDL level in case group subjects was decreased as compared to control group subjects (cases- 1.90±0.951 control- 2.05±0.946), which is not statistically significant (p>0.05).

DISCUSSION

In our study, case group subjects showed an increase in lipids and lipoprotein levels when compared with control group subjects. The levels of TC, TAG, LDL, VLDL, and Lp(a) were increased and HDL level was decreased in cases group subjects as compared to control group subjects.

Our study results are in agreement with the following studies done, in a similar study done by Shankarprasad et al, the triglycerides, total cholesterol, and LDL cholesterol were higher in cases as compared to controls, and HDL was found to be lower.[9] Bruckert et al, in their study, showed that high serum levels of Lp(a) were discovered in diabetic subjects when compared with nondiabetic control subjects.[10] When a study was conducted by Yeğin et al, on diabetic subjects, the glycated lipoprotein fractions were significantly increased in the complicated diabetic group when compared to diabetic control subjects without complications.[11] Bitzur et al, Zabeen et al and Biadgo et al, in their study, revealed that there is an association between high TAG, TC, LDL, VLDL, and low HDL in diabetic patients.[12-14]

The cases group (subjects with uncomplicated diabetes mellitus) was suffering from high levels of TC, TAG, LDL, VLDL, and Lp(a), they were prone to cardiovascular diseases.[15]

A small sample size of our study and lack of controls and cases from the hospital were the limitations of the study but the specificity of our work was not affected.

CONCLUSION

Our study verifies that high levels of lipids and lipoprotein are found in subjects with uncomplicated diabetes mellitus of the case group when compared to healthy subjects of the control group.

This shows that a significant relationship exists between subjects with uncomplicated diabetes mellitus with high lipids and lipoprotein levels and cardiovascular diseases.

REFERENCES

1. Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. Diabetes Res Clin Pract. 2019;157:107843.
2. Brancati FL, Kao WHL, Folsom AR, Watson RL, Szklo M. Incident type 2 diabetes mellitus in African American and white adults: The atherosclerosis risk in communities study. J Am Med Assoc. 2000;283(17).
3. Dailey GE, Mohideen P, Fiedorek FT. Lipid effects of glyburide/metformin tablets in patients with type 2 diabetes mellitus with poor glycemic control and dyslipidemia in

an open-label extension study. Clin Ther. 2002;24(9).

4. Chattanda S, Mgonda Y. Diabetic dyslipidemia among diabetic patients attending specialized clinicsin Dar es Salaam. Tanzania Med J. 2008;23(1).
5. Watson KE, Horowitz BN, Matson G. Lipid abnormalities in insulin resistant states. Rev Cardiovasc Med. 2003;4(4).
6. Tipping RW, Ford CE, Simpson LM, Walldius G, Jungner I, Folsom AR, et al. Lipoprotein (a) concentration and the risk of coronary heart disease, stroke, and nonvascular mortality. JAMA J Am MedAssoc. 2009;302(4).
7. Oliver J. Guidelines for the prevention, management and care of diabetes mellitus. J Chem Inf Model. 2013;53(9):1689-99.
8. Inada A, Weir GC, Bonner-Weir S. Induced ICER Iγ down-regulates cyclin a expression and cell proliferation in insulin-producing β cells. Biochem Biophys Res Commun. 2005;329(3):925-9.

   Shankarprasad DS, Gundalli S, Mahantesh B, Kashinakunti SV, Sunitha P. Lipid profile in diabetes mellitus. Indian J Pathol Oncol. 2015;2(4):290-4.
9. Bruckert E, Davidoff P, Grimaldi A, Truffert J, Giral P, Doumith R, et al. Increased serum levels of lipoprotein(a) in diabetes mellitus and their reduction with glycemic control. JAMA J Am Med Assoc. 1990;263(1):35-6.
10. Yeğin A, Özben T. Serum glycated lipoproteins in type II diabetic patients with and withoutcomplications. Ann Clin Biochem. 1995;32(5):459- 63.
11. Bitzur R, Cohen H, Kamari Y, Shaish A, Harats D. Triglycerides and HDL cholesterol: stars or second leads in diabetes? Diabetes Care. 2009;32(2):373-7.
12. Zabeen B, Balsa AM, Islam N, Parveen M, Nahar J, Azad K. Lipid profile in relation to glycemic controlin Type 1 diabetes children and adolescents in Bangladesh. Indian J Endocrinol Metab. 2018;22(1).
13. Biadgo B, Abebe SM, Baynes HW, Yesuf M, Alemu A, Abebe M. Correlation between serum lipid profile with anthropometric and clinical variables in patients with type 2 diabetes mellitus. Ethiopian J Health Sci. 2017;27(3):215-26.
14. Pant DC, Mowar AB, Chandra N. Co-relation between total cholesterol, high density lipoprotein, low density lipoprotein and glycosylated haemoglobin (HbA1c) in diabetic patients with acute coronary syndrome (ACS). J Assoc Phys India. 2018;66(July):1-5.