

## Original Research Article

# Study of lipids and lipoprotein levels in uncomplicated diabetes mellitus patients attending Shadan hospital

Samatha Tulla<sup>1</sup>, Syeda Ayesha Siddiqua<sup>2\*</sup>

<sup>1</sup>Department of General Medicine, <sup>2</sup>Department of Pharmacology, Shadan Institute of Medical Sciences, Hyderabad, Telangana, India

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### \*Correspondence:

Dr. Syeda Ayesha Siddiqua,

E-mail: [ayesharesearch123@gmail.com](mailto:ayesharesearch123@gmail.com)

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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, VLDL

### 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.<sup>1</sup> 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.<sup>2</sup> Diabetes mellitus and dyslipidemia constitute major independent and risk factors of coronary heart disease.<sup>3</sup>

The prevalence of dyslipidemia in diabetes mellitus patients is 95%.<sup>4</sup> 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 VLDL and decrease in HDL.<sup>5</sup>

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.<sup>6</sup>

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<sup>7</sup>**

1) FBS:  $\geq 126$  mg/dl, 2) PPBS:  $>200$  mg/dl, 3) HbA1c:  $\geq 6$  mg/dl.

**Lipid profile (dyslipidemia) as per NCEP ATP III guidelines<sup>8</sup>**

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):  $\geq 30$  mg/dl.

**Statistical analysis**

Data was analysed using SPSS software. Data were expressed as mean $\pm$ SD and p value  $<0.05$  was considered statistically 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.

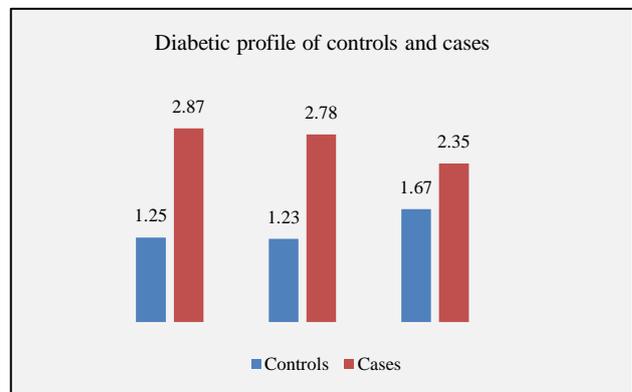
The subjects aged below 30 years and above 60 years, alcoholics, smokers, and the subjects suffering from obstructive jaundice, hypothyroidism, hypopituitarism, epilepsy, psychiatric complaints, and nephrotic syndrome were excluded from the study, to avoid the influence of these disorders on lipids and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

**Table 1: Demographic and clinical characteristics of control and cases subjects.**

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

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

The average age of control and case group subjects was 1.62 $\pm$ 0.846 and 2.22 $\pm$ 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 $\pm$ 0.468, PPBS-2.78 $\pm$ 0.555, and HbA1c-2.35 $\pm$ 0.606) was observed when compared to the control group (FBS- 1.25 $\pm$ 0.600, PPBS- 1.23 $\pm$ 0.563, and HbA1c- 1.67 $\pm$ 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 $\pm$ 0.901, 2.07 $\pm$ 0.954, 2.35 $\pm$ 0.899, 2.17 $\pm$ 0.960, and 2.45 $\pm$ 0.852, respectively. And in control group

subjects were  $1.27\pm 0.634$ ,  $1.52\pm 0.792$ ,  $1.93\pm 0.972$ ,  $1.52\pm 0.792$ , and  $1.22\pm 0.555$ , respectively.

**Table 2: Comparison of lipids and lipoprotein levels in control and cases subjects.**

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

Data represented as mean $\pm$ 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-  $1.90\pm 0.951$  control-  $2.05\pm 0.946$ ), 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.<sup>9</sup> 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.<sup>10</sup> When a study was conducted by Yeğın 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.<sup>11</sup> 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.<sup>12-14</sup>

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.<sup>15</sup>

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.

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