

# Lipid Profile and Glycated Hemoglobin (HbA1c) in Diabetic Sudanese Patients

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**Abstract:** A prospective descriptive hospital-based cross-sectional study was carried out to compare the lipid profile in diabetic and non-diabetic persons. 70 diabetic patients (34 males and 36 females) participated in this study, in addition to 30 healthy individual enrolled as a control group. Lipid profile level and HbA1c concentration were significantly ( $P<0.05$ ) higher in diabetic patients than control group. There was statistically no significant difference between male and female diabetic patients. There was positive correlation between age and level of triglycerides but negative correlation between age and HbA1c in diabetic patients.

**Keywords:** Diabetes mellitus, lipid profile, HbA1c.

## 1. Introduction

Diabetes mellitus (DM) is a group of metabolic diseases characterized by increase blood glucose level resulting from defects in insulin secretion, insulin action or both [1]. A cross-sectional study among patients attending a primary care clinic in June 2009 conducted in Saudi Arabia, of 6024 subjects, diabetes mellitus was present in 1792 showing prevalence of 30% [2].

End organ damage is the expected final consequence of chronic hyperglycemia, which occurs over the long term. The most frequently affected organs being: coronary arteries, cerebrovascular circulation, retinal arteries, renal microvasculature and tiny arteries of the nerves (vasa nervosa) [3].

CVDs are listed as the cause of death in 65% of persons with diabetes. Diabetes acts as an independent risk factor for several forms of CVD. To make matters worse, when patients with diabetes develop clinical CVD, they sustain a worse prognosis for survival than do CVD patients without diabetes [4].

The dyslipidemia is a major risk factor for coronary heart disease (CHD) [5]. The prevalence of dyslipidemia in diabetes mellitus is 95% [6]. Patients with type 2 diabetes mellitus have a two to threefold increased incidence of diseases related to atheroma [7] and those who present in their 40s and 50s have a twofold increased total mortality [8].

The aim of this study is to compare the levels of lipid profile as well as HA1C in diabetic and non-diabetic persons. If hyperlipidemia is detected early in the course of diabetes mellitus this will offer the best chance of non-pharmacological and pharmacological management leading to significant reduction in mortality and morbidity from cardiovascular disease.

## 2. Materials and Methods

The study included 70 diabetic patients (34 male and 36 female), with age ranging from 5 to 80 years, whom were admitted to Khartoum hospital and Tuti clinic centre, in addition to 30 healthy Sudanese volunteers whom were included as a control group. This study was conducted during the period from January to March 2013.

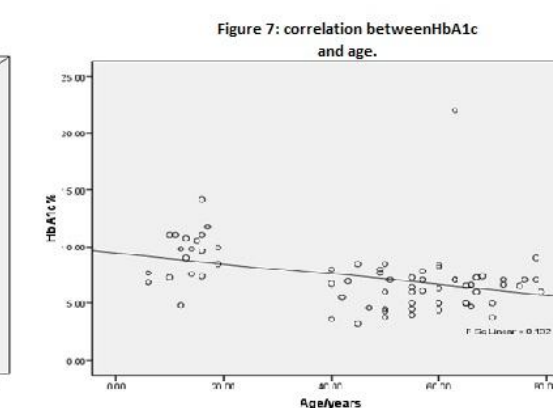
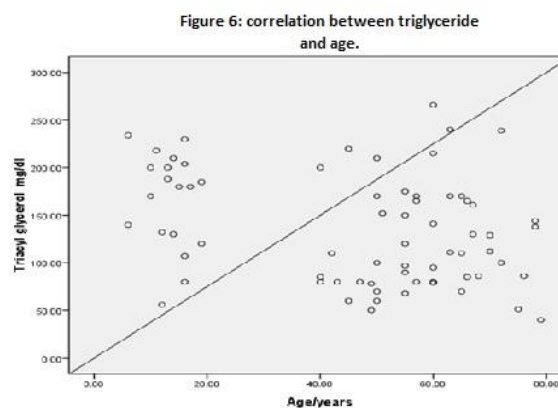
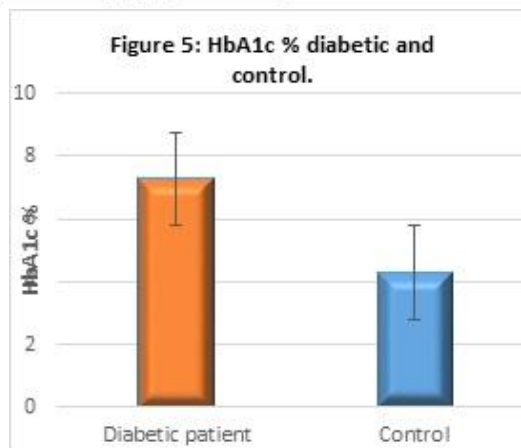
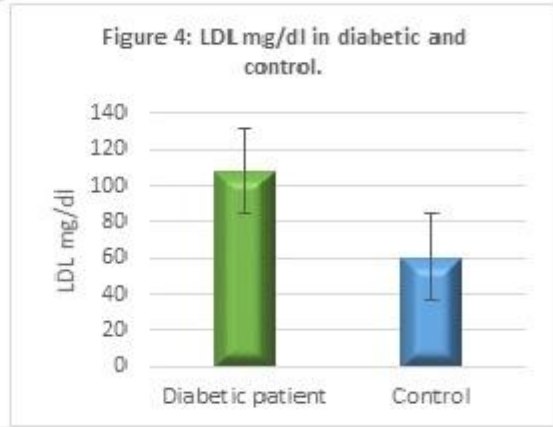
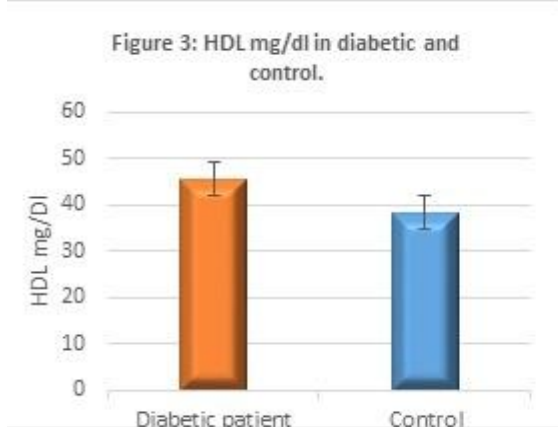
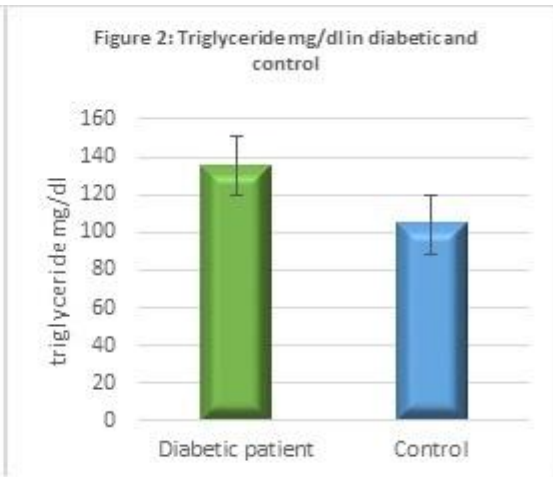
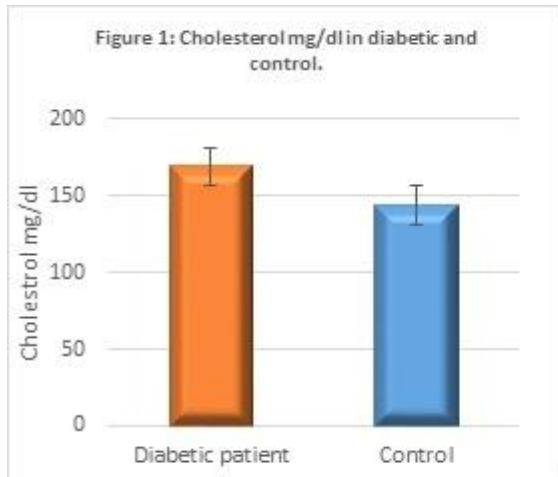
A fasting venous blood sample of 5 ml was collected from both groups in heparinized containers. Samples were divided into two portions, the first one was used as whole blood to estimate the HA1c, and the other portion was centrifuged at 5000 rpm for 10 minutes to separate serum from blood cells. Serum samples were kept at  $-20^{\circ}\text{C}$ .

Estimation of plasma total cholesterol, serum triglycerides and serum HDL-c was done by spectrophotometric enzymatic method, which was obtained commercially from (linear chemicals, Spain). Estimation of HbA1c was done by Nycocard HbA1c Methods.

## 3. Results

Out of 70 diabetic patients, 49% were males and 51% were females. The cholesterol concentration showed statistically significant difference ( $P<0.05$ ) among the studied groups, the highest cholesterol concentration was in diabetic patient ( $168.83\pm 50.15\text{mg/dl}$ ), followed by the control group ( $143.70\pm 28.797\text{mg/dl}$ ) as shown in (table: 1) and (figure: 1).

Results shown in (table: 1) and (figure: 2) indicate that there was significant difference ( $P<0.05$ ) in triglyceride concentration among studied groups, the highest triglyceride concentration was shown in diabetic patients ( $135.67\pm 57.29\text{mg/dl}$ ), followed by the control group ( $104.17\pm 46.79$ ).



Results presented in (table: 1) and (figure: 3) indicate that there was significant difference ( $P < 0.05$ ) in HDL concentration among studied groups, the highest concentration was in diabetic patients ( $45.44 \pm 13.80$  mg/dl),

followed by the control group ( $38.20 \pm 6.84$  mg/dl). The results in (table: 1) and (figure: 4) showed statistically highly significant difference ( $P < 0.001$ ) in LDL concentration among studied groups, the highest LDL concentration was observed

in diabetic patients (108.24±37.00 mg/dl) followed by control group (60.23±36.96 mg/dl).

**Table 1:** lipid profile in diabetic and non- diabetic individuals

Parameters tested	Disease state		P value
	DM	Control	
Cholesterol mg /dl	168.83±50.15	143.70±28.797	0.012
Triacylglycerol mg/dl	135.67±57.29	104.17±46.79	0.009
HDL mg/dl	45.44±13.80	38.20±6.84	0.008
LDL mg/dl	108.24±37.00	60.23±36.96	0.000
HbA1c %	7.26±2.83	4.29±0.59	0.000

HbA1c showed highly significant difference between studied group (table: 1) and (figure: 5), the higher percentage of HbA1c was shown in diabetic group (7.26±2.83 %) followed by the control group (4.29±0.59 %)

**Table 2:** lipid profile and gender

Parameter	Gender		P value
	Male	Female	
Cholesterol mg /dl	165.59±42.60	171.89±56.81	0.603
Triacyl glycerol mg/dl	133.94±59.50	137.31±55.93	0.803
HDL mg/dl	43.35±11.94	47.42±15.25	0.218
LDL mg/dl	108.38±33.46	108.11±40.54	0.976
Hb A1c %	7.0824±3.23171	7.4250±2.42	0.616

(Figure: 6) indicates that there was statistically significant positive correlation ( $P < 0.05$ ) between age and triglycerides concentration, while (figure: 7) shows significant negative correlation ( $P < 0.01$ ) between age and HbA1c. The results presented in (Table: 2) indicate that there is no statistically significant difference between males and females for cholesterol, triacylglycerol, HDL, LDL and HbA1c.

#### 4. Discussion

Diabetes mellitus have several complications including elevated levels of LDL and triglyceride [9]. The current study shows elevated levels of HbA1c, triglycerides, LDL and cholesterol in diabetic patients more than control group therefore this agree with Samatha et al., [10] and VinodMahato et al., [11]. In this study, the concentration of HDL showed raised level in diabetic patients more than control group and this finding agrees with the previous studies of Singh, and Kumar [12]. and Oluyomi et al. [13].

In the present study, the concentration of cholesterol, triglyceride, LDL, HDL, and HbA1c shows no significant difference between males and females and this agrees with VinodMahato et al. [11] and disagrees with ultra et al [14] and Samatha et al [10].

Patients with diabetes mellitus have abnormal plasma lipid levels and frequently may develop raised lipid profile and they are at increased risk of coronary heart disease [15] and peripheral vascular disease because of the possibility of structural and functional abnormalities that may have impaired the lipid metabolism and transport system in diabetic patients.

Hyperlipidaemia as a metabolic abnormality is frequently associated with diabetes mellitus. Its prevalence is variable, depending on the type and severity of diabetes, glycaemic control, nutritional status, age and other factors. The most characteristic lipid abnormality in diabetics is hypertriglyceridaemia, with or without associated increase in plasma total cholesterol.

#### 5. Conclusion

The study concluded that there was significant difference between the level of lipid metabolites and HbA1c in diabetic patients (males and females) when compared with control subjects. However, there was no statistically significant difference between male and female diabetic patients in all parameters (TC, TG, HDL, LDL and HbA1c). There was significant positive correlation between age and triglycerides concentration and significant negative correlation between age and HbA1c in diabetic patients.

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