



## Monitoring of Lipid Profile in Diabetic Mellitus Type 2 Patients Controlled and Uncontrolled in Sana'a, Yemen

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### ABSTRACT

Diabetic Mellitus (DM) is the most frequent endogenous cause of fat metabolism disorder. Therefore, the study aims to monitor the lipid profile in DM type 2 patients controlled and uncontrolled in Sana'a, Yemen. The study included 150 subjects from major public hospitals in Sana'a city, Yemen. 50 were diagnosed with DM type 2 controlled as group I and 50 were diagnosed with DM type 2 uncontrolled as group II. 50 subjects were healthy volunteers as control group. The biochemical parameters namely Fasting Blood Sugar (FBG), and Glycated Hemoglobin (HbA1c) were assayed in three groups. Data obtained were analyzed using suitable statistical tools. The lipid profile namely total cholesterol mg/dl, triglyceride mg/dl, HDL mg/dl, and LDL mg/dl were assayed in DM type 2 controlled and uncontrolled and compared with control healthy group. The results were described namely ( $166 \pm 31$  mg/dl ;  $196 \pm 50$  ;  $131 \pm 28$ ), ( $146 \pm 60$  mg/dl ;  $193 \pm 94$  ;  $92 \pm 30$ ), ( $37 \pm 8.2$  mg/dl,  $36 \pm 14$ ,  $42 \pm 12$ ), and ( $80 \pm 25$  mg/dl,  $95 \pm 30$ ,  $76 \pm 25$ ) respectively. According to above results, non different significant ( $p > 0.05$ ) in all parameters of lipid profile was observed between DM type 2 controlled and uncontrolled groups. While the results were observed different significant ( $p < 0.05$ ) in serum levels of total cholesterol, triglyceride and LDL between controlled and healthy group and also non-different significant ( $p > 0.05$ ) in serum levels of HDL between both. In addition, different significant ( $p > 0.05$ ) in all parameters of lipid profile was observed between uncontrolled and control healthy groups. The study outcome concluded that the hyperlipidemia may progressive in DM type 2 patients uncontrolled.

**Keywords:** Diabetic mellitus, type 2, lipid profile, insulin resistance, controlled, uncontrolled

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## INTRODUCTION

Diabetic mellitus (DM) type 2 is the predominant form of Diabetes and accounts for at least 90% of all cases of Diabetes Mellitus <sup>1</sup>. The rise in prevalence is predicted to be much greater in developing than in developed countries (69 % versus 20%) <sup>2</sup>. In developing countries, people aged 40 to 60 years (that is, working age) are affected most, compared with those older than 60 years in developed countries. This increase in DM type 2 is inextricably linked to changes towards a Western lifestyle (high diet with reduced physical activity) in developing countries and the rise in prevalence of overweight and obesity <sup>3,4</sup>. There are approximately 1.4 million people with diagnosed DM type 2 in the UK<sup>5</sup>.

The incidence of diabetes increases with age, most cases being diagnosed after the age of 40 years. This equates to a lifetime risk of developing Diabetes of 1 in 10 <sup>6</sup>. Type 2 Diabetes is a heterogenous disorder caused by a combination of genetic factors related to impaired insulin secretion, insulin resistance and environmental factors such as obesity, over eating, lack of exercise, and stress as well as aging <sup>7</sup>. It is typically a multifactorial disease involving multiple genes and environmental factors to varying extents <sup>8</sup>.

On the other hand, DM is the most frequent endogenous cause of fat metabolism-disorder. In DM the risk for arteriosclerosis is significantly higher and the clinical significance of hyperlipidemia should be estimated more serious as in non-diabetics <sup>9</sup>. Therefore, our study aimed to monitor the lipid profile in DM type 2 patients controlled and uncontrolled in Sana'a , Yemen.

## MATERIALS AND METHOD

### Study design

This study was conducted among individuals who came to medical clinic in major public hospitals in Sana'a city previously diagnosed as DM type 2. The subjects were divided into three groups, the first group was 50 DM type 2 controlled, the second group was 50 DM type 2 uncontrolled, and the third group was 50 healthy non- diabetic people as control.

### Ethical issues

Subjects received a simple explanation of the aim of the study and asked to participate. If they agreed, the sample was collected and an interview was conducted. Confidentiality of the collected data was achieved by keeping data record in a locked room with limited access to the

research team only. Clinical information was obtained from the patients. Information included the name, sex, age, body mass index (BMI), duration of diabetic, chronic diseases associated, and drug admiration.

#### **Inclusion and exclusion criteria**

The inclusion criteria included, cases of DM type 2 controlled with an HbA1c less than or equal to 7 and with age more than 30 years and less than 70 years. Cases of DM type 2 uncontrolled with an Glycated hemoglobin (HbA1c) more than 7 aged more than 30 years and less than 70 years.

#### **Sample collection**

After obtaining the consent of cases and controls participation as voluntaries in the study and obtain required patient details. 7 ml of blood was collected from anticubital vein after fast overnight 8-12 hours. Blood was collected in EDTA vacutainer (2ml) and plain vacutainer (5ml). Blood collected in plain vacutainer was processed to obtain serum and following parameters were estimated namely serum fast food sugar, insulin for obtain Homa IR, serum cholesterol, serum triglycerides, serum HDL cholesterol, serum LDL cholesterol. Blood collected in EDTA tube was used for estimation of: HbA1c.

#### **Assay of glucose and glycated hemoglobin**

The serum blood glucose namely Fasting Blood Sugar (FBS) was estimated based on enzymatic method using photometric method. On the other hand, the HbA1c was assayed by immuneturbidimetry method<sup>10,11</sup>.

#### **Lipid profile**

This test was measured after a 12-hour fast (no food or drink, except water). For the most accurate results. The lipid profile included the total cholesterol mg/dl, triglyceride mg/dl HDL mg/dl, and LDL mg/<sup>12</sup>.

#### **Statistical analysis**

Statistical Package for Social Sciences Software (SPSS, Version 18) was used for the statistical analysis. The differences between the groups were tested using suitable statistical test and the significant at  $p < 0.05$  was used in all tests

## **RESULTS AND DISCUSSION**

#### **Subjects characteristics**

The background information of the clinical history for the 150 samples in three groups were summarized in (Table 1). The group I was DM type 2 controlled, the group II was DM type 2

uncontrolled and the group III was health control group. The personal data namely age, sex, and Body Mass Index (BMI) was recorded and results showed that the age of the patients included in this study between 36 to 53 years with 1:1.4 male: female ratio (Table 1).

**Table 1: Subject Characteristics**

Parameters	Group I n=50	Group II n=50	Group III n=50
Age	46.4±6.8	46.9 ±7.5	40 ±3.8
Sex			
• Male	22	30	26
• Female	28	20	24
BMI	228 ± 3.33	27 ± 2.3	21 ± 2.51

### Level of glucose and HbA1C in DM type 2 controlled and uncontrolled

The levels of FBS, and HbA1C were investigated in DM type 2 controlled as group I and uncontrolled as group II and summarized in Table .2. In the group I, the results presented show the mean of the FBG level was  $141 \pm 41$  mg/dl while the mean of the HbA1C level was  $6.3 \pm 0.56$  %. On the other mean , significant increase ( $p < 0.05$ ) in FBS level in comparing with the group III (control health group) namely  $84 \pm 12.3$  mg/dl that was non- within to normal range (70 – 110 mg/dl) , also significant increase ( $p > 0.05$ ) in HbA1c in comparing with control group (Table .2). However, in the group II. According to biochemical assays for FBS , and HbA1C and the results proved significant increase ( $p < 0.05$  ) in all parameters namely  $209 \pm 81$  mg/ml and  $10.23 \pm 1.7$  % , respectively in comparing with group III (Table 2).

**Table 2: Assay of glucose and related parameters in DM type 2 controlled and uncontrolled**

Parameters	Group I	Group II	Group III
FBS mg/dl	$141 \pm 41$ *	$209 \pm 81$ €	$84 \pm 12$
HBA1C%	$6.3 \pm 0.56$ *	$10.23 \pm 2$ €	$4.3 \pm 0.62$

\* : Different significant between group I and III ( $p < 0.05$  )  
 € : Different significant between group II and III ( $p < 0.05$  )

### Level of lipid profile in DM type 2 controlled and uncontrolled

In our study was recorded, the total cholesterol mg/dl, triglyceride mg/dl HDL mg/dl, and LDL mg/ were assayed in DM type 2 controlled and DM type 2 uncontrolled and compare with healthy group. The results were summarized in (Table 4) ( $166 \pm 31$  mg/dl ;  $196 \pm 50$  ;  $131 \pm 28$  ) , ( $146 \pm 60$  mg/dl ;  $193 \pm 94$  ;  $92 \pm 30$  ) , ( $37 \pm 8.2$  mg/dl ,  $36 \pm 14$  ,  $42 \pm 12$  ) , and ( $80 \pm 25$  mg/dl ,  $95 \pm 30$  ,  $76 \pm 25$ ) respectively . According to above results, the results were observed significant differences ( $p < 0.05$ ) in mean levels of total cholesterol, triglyceride and HDL between Group I and Group III and also non - different differences ( $p > 0.05$ ) in mean level of

LDL between both, while significant differences ( $p < 0.05$ ) were observed in mean levels of total cholesterol, triglyceride and LDL between Group I and Group II. Non - different differences ( $p > 0.05$ ) in mean level of HDL between both. In addition, significant differences ( $p < 0.05$ ) in all parameters of lipid profile was observed between Group II and Group III.

**Table 4: Assay of lipid level in DM type 2 controlled and uncontrolled**

Hormones	Group I	Group II	Group III
Total cholesterol mg/dl	167 ± 31 +	196 ± 50 * €	131 ± 28
Triglyceride mg/dl	146 ± 60 +	193 ± 94* €	92 ± 30
HDL mg/dl	37 ± 8.2 +	35 ± 14 €	42 ± 12
LDL mg/dl	80 ± 25	95 ± 30 * €	76 ± 25

\* : significant differences between group I and II ( $p < 0.05$ ) + : significant differences between group I and III ( $p < 0.05$ ) € : significant differences between group II and III ( $p < 0.05$ )

## DISCUSSION

The lipid profile in DM type 2 was performed and discussed in this work. DM type 2 is associated with market increased risk of cardiovascular disease (CVD) individuals with diabetes have an absolute risk of major coronary events similar to that of non diabetic individuals with established coronary heart disease (CHD). Therefore, the lipid profile of DM type 2 must be monitored<sup>13</sup>. On the other mean, the rationale for therapy must be performed

In the present study lipid profile parameters except HDL were found to be increased in DM type 2 controlled and uncontrolled when compared to control health group. These finding were in accordance with a previous study conducted by Khan et al which concluded that individuals with good glycemic control (HbA1c <7 %) had statistically significant differences in the values of total cholesterol, and triglycerides as compared to individuals with poor glycemic control<sup>14</sup>.

Management is directed at improving glycemic control, altering dietary composition, and reducing calories in patients. Improved glycemic control is effective in reducing triglyceride and cholesterol levels in DM subjects<sup>15</sup>. The predominant abnormality of fat metabolism in DM is hypertriglyceridemia due to an increase of triglyceride-carrying lipoproteins, the chylomicrons and the very-low-density lipoproteins. Usually in non-insulin-dependent diabetics LDL-cholesterol-levels can be seen elevated and HDL-cholesterol-concentration decreased in correlation with the metabolic control<sup>9</sup>.

## CONCLUSION

In conclusion, hyperlipidemia is a pathological state that adversely affects diabetic control and is commonly found in most forms of DM type 2. On the other hand, the study outcome concluded

that the hyperlipidemia may progressive in DM type 2 patients uncontrolled. Altered lipid profile have been described in patients with diabetes especially these with poor glycemic control more than non – control of DM patients. Finally, good glyacemic control and dietary modification are usually enough for prevention the hyperlipidemia in DM.

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