



**International Journal of Biological  
&  
Pharmaceutical Research**  
Journal homepage: [www.ijbpr.com](http://www.ijbpr.com)

IJBPR

## STUDY OF LIPIDS PROFILE IN DIABETIC, PRE-DIABETIC AND NON DIABETIC HYPOTHYROID PATIENTS

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### ABSTRACT

Hypothyroidism is one of the most common functional disorders of the thyroid. Dyslipidemia in diabetes mellitus can include all the various types of lipoproteins. Dyslipidemia is a well-recognized and modifiable risk factor that should be identified early in diabetes to institute aggressive cardiovascular preventive management. This randomized study was carried out on 60 Iraqi hypothyroid patients and apparently healthy control subjects with total number of 30 were included in this study. The two groups were subjected to receive an (OGTT) and blood sample was collected for measurement of (Blood glucose, HbA1c, TC, TG, LDL-C, HDL-C, VLDL-C). There were significant differences ( $P < 0.05$ ) when compared (TC, TG, HDL-C, LDL-C, VLDL-C) in study groups (diabetes, prediabetes, non diabetes) with control group. Conclusion: Seems from the results that hypothyroidism has great impact on lipids profile in the sera of the patients.

**Key Words:** Lipids profile, Hypothyroidism, Diabetes.

### INTRODUCTION

Hypothyroidism is a clinical entity resulting from the deficiency of thyroid hormones or from their impaired activity (Hallengren, 1998; Murgod and Soans, 2012). Hypothyroidism which it is a common metabolic disorder in the general population being the commonest thyroid disorder (Unnikrishnan and Menon, 2011). Thyroid hormones perform a wide array of metabolic functions including regulation of lipid, carbohydrate, protein and electrolyte and mineral metabolisms. Thyroid hormones stimulate the utilization of the lipid substrates, owing to an increased mobilization of the triglycerides which are stored in the adipose tissue (Pucci *et al.*, 2000).

Hypothyroidism is associated with dyslipidemia and abnormalities of lipids metabolism. (Shekhar and Srinivas, 2011), dyslipidemia in diabetes mellitus can include all the various types of lipoprotein identified in the general

population; The characteristic features of this phenotype are a high plasma triglyceride concentration, low HDL cholesterol concentration and increased concentration of small dense LDL-cholesterol particle. All attributed mostly to insulin resistance and insulin deficiency. Dyslipidemia is a well-recognized and modifiable risk factor that should be identified early in diabetes to institute aggressive cardiovascular preventive management (Arshag and Mooradian, 2009). The study aims to detect the effect of dyslipidemia in patients with hypothyroidism in the development of diabetes and management the situation early from progress.

### MATERIALS AND METHODS

This randomized study was carried out on 60 Iraqi hypothyroid patients and apparently healthy control subjects with total number of 30 were included in this study. Their ages were between (30-60) years old. The two groups were subjected to receive an oral glucose tolerance test (OGTT) (75 gm. of glucose in 300 ml of water). The subjects were asked to fast over night following which fasting blood samples were collected. EDTA tube for

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collecting whole blood was used for the estimation of (HbA1c %), serum used for the estimation of fasting blood glucose, fasting lipids profile (Total cholesterol, Triglycerides, low density lipoprotein cholesterol, very low density lipoprotein cholesterol, high density lipoprotein cholesterol), In addition after one hour and two hour thereafter blood sample obtained for measurements of glucose.

#### LABORATORY ASSESSMENT

Blood glucose, HbA1c and lipids profile were measured by enzymatic method (SPECTRUM Germany).

#### Procedure

Criteria for the diagnosis of diabetes were used in present study; these criteria were submitted by world health organization (WHO) and American Diabetes Association (ADA) (Niflioglu *et al.*, 2012). That classified diabetes when fasting blood glucose (FBG) is ( $\geq 126$  mg/dl), plasma blood glucose after two hours from having OGTT is ( $\geq 199$ mg/dl) and HbA1c % is ( $\geq 6.5$  %). ; Pre-diabetes when (FBG) is between (100-125) mg/dl, (PBG) is between (140-199) mg/dl and HbA1c % is between (5.7-6.4%).

#### Statistical Analysis

The Statistical Analysis System- SPSS (2004) was used to effect of difference factors (concentration or strain) in study parameters. The least significant difference (LSD) test of the comparative between means in this study. The usual methods, which used in order to analysis and assess the results, they include:-Descriptive statistics (Statistical tables).

#### RESULTS

According to the criteria of WHO and ADA there were (15) % of the hypothyroid patient have diabetes and (55) % are pre-diabetes and (30) % does not have diabetes. Table (1). The results in the table (2) showed the highest level of total cholesterol was in the diabetic group ( $320.16 \pm 88.21$ )mg/dl and followed by the pre-diabetic group ( $234.14 \pm 62.42$ ) mg/dl .The statistical analysis showed that there is a significant difference ( $P < 0.05$ ) when compared the total cholesterol with the control in diabetic group, pre-diabetic group and in non diabetic group .

According to the triglycerides, the highest level was in the diabetic group ( $207.44 \pm 85.93$ ) mg/dl and followed by the pre-diabetic group ( $166.06 \pm 80.98$ ) mg/dl and the statistical test showed that there were significant differences(  $P < 0.05$ ) when compared the level of triglyceride of the groups (diabetic ,pre-diabetic and non diabetic group) with the level in control group. Table (2).

The results of HDL-C were comparable with each other and are relatively low when compared with the control group ( $52.22 \pm 6.88$ ), there were significant differences ( $p < 0.05$ ) in diabetic group, in pre-diabetic group and in non diabetic group ( $34.11 \pm 9.7$ ,  $35.13 \pm 13.5$ ,  $33 \pm 14.44$ ) respectively. Table (2).

According to the level of VLDL-C there were also significant differences ( $P < 0.05$ ) in diabetic group, in pre-diabetic group and in non diabetic group ( $41.55 \pm 17.18$ ,  $34.04 \pm 16.74$ ,  $30.44 \pm 13.14$ ) respectively when compared with the control group ( $23.26 \pm 10.6$ ).

The levels of LDL-C were rather too high in study groups when compared with control group ( $119.15 \pm 68.22$ ) ( $P < 0.05$ ), in diabetic group , pre-diabetic group and in non diabetic group ( $229.11 \pm 105.61$ ,  $188.82 \pm 92.86$ ,  $164.38 \pm 66.26$ ) respectively.

**Table 1. Distribution of hypothyroid patients according to the criteria of WHO and ADA**

Study groups	Non diabetic	Pre diabetic	Diabetic
Numbers	18	33	9
Percentage%	30%	55%	15%

**Table 2. Concentration rates of lipids profile in study groups comparing with control group.**

Study groups	Total cholesterol Mg/dl		Triglycerides Mg/dl		HDL-C Mg/dl		VLDL-C Mg/dl		LDL-C Mg/dl	
	M $\pm$ SD	Degree of sig.	M $\pm$ SD	Degree of sig	M $\pm$ SD	Degree of sig.	M $\pm$ SD	Degree of sig	M $\pm$ SD	Degree of sig.
Diabetic group	320.16 $\pm$ 8 8.21	3.28 **	207.44 $\pm$ 85 .93	2.499 *	34.11 $\pm$ 9. 7	2.596 *	41.55 $\pm$ 17 .18	2.607 *	229.11 $\pm$ 10 5.61	2.383 **
Pre-diabetic group	234.14 $\pm$ 6 2.42	4.694 **	166.06 $\pm$ 80 .98	3.337 **	35.13 $\pm$ 1 3.5	7.020 **	34.04 $\pm$ 16 .74	3.782 **	188.82 $\pm$ 92 .86	4.736 **
Non diabetic group	233.93 $\pm$ 9 8.97	0.255*	110.41 $\pm$ 42 .06	2.849 *	33 $\pm$ 14.4 4	5.291 **	30.44 $\pm$ 13 .14	3.062 **	164.38 $\pm$ 66 .26	3.821 **
Control group	157.57 $\pm$ 3 1.88	-----	116.33 $\pm$ 53 .07	----	52.22 $\pm$ 6. 88	-----	23.26 $\pm$ 10 .6	---	119.15 $\pm$ 68 .22	----

\*significant \*\*highly significant

## DISCUSSION

Thyroid hormones perform a wide array of metabolic functions including regulation of lipid, carbohydrate, protein and electrolyte and mineral metabolisms. The most important effect on lipid metabolism includes mobilization of triglycerides from the adipose tissue causing increased concentration of free fatty acids in plasma. In patients with overt hypothyroidism there is an increase in serum total cholesterol (TC), low density lipoprotein cholesterol (LDL-C), levels and possibly triglyceride (TG) levels (Murgod and Soans, 2012; Niflioglu *et al.*, 2012) and this is compatible with our results where the objective of these study was to find out the effect of hypothyroidism on certain electrolyte & mineral levels and also on lipid profile; so it was found that level of high density lipoprotein (HDL) was significantly decreased and level of low density (LDL), triglycerides and very low density lipoprotein (VLDL) increased in subclinical and clinical hypothyroid diabetic patients. These results are agreed with previous study aimed to see the effect of thyroid dysfunction on serum lipid profile parameters among the people of Bastar region and the results were elevated levels of TC, Tg, LDL-C, VLDL-C, TC/HDL ratio, and significantly decreased HDL-C were observed in hypothyroid patients (Aziz *et al.*, 2012).

Thyroid hormones induce the 3-hydroxy-3-ethylglutaryl coenzyme A (HMG-CoA) reductase, which is the first step in cholesterol biosynthesis. Moreover, triiodothyronine (T3) upregulates LDL receptors by controlling the LDL receptor gene activation. This T3-mediated gene activation is done by the direct binding of T3 to specific thyroid hormone responsive elements (TREs) (Bakker *et al.*, 1998; Rizos *et al.*, 2011). Furthermore, T3 controls the sterol regulatory element-binding protein, which in turn regulates LDL receptor's gene expression (Shin and Osborne, 2003). T3 has also been associated with protecting LDL from oxidation (Faure *et al.*, 2004). Thyroid hormones can influence HDL metabolism by increasing cholesteryl ester transfer protein (CETP) activity, which exchanges cholesteryl esters from HDL2 to the very low density lipoproteins (VLDL) and TGs to the opposite direction (Lagrost, 1994). In addition, thyroid hormones stimulate the lipoprotein lipase (LPL), which catabolizes the TG-rich lipoproteins, and the hepatic

lipase (HL), which hydrolyzes HDL2 to HDL3 and contributes to the conversion of intermediate-density lipoproteins (IDL) to LDL and in turn LDL to small dense LDL (Kuusi *et al.*, 1980; Santamarina *et al.*, 2004).

Dyslipidemia is very common in type 2 diabetes and it is characterized by hypertriglyceridemia and low levels of high density lipoprotein cholesterol (HDL-C), an important cause of morbidity (Betteridge, 2000). Diabetes mellitus is usually associated with hypertriglyceridemia more frequently when serum triglyceride exceeds more than 5.2 mmol/l (200 mg/dl) and obesity as well (Malik *et al.*, 1997). And this was identical with our results especially in diabetic group.

Type 2 diabetes and obesity are often comorbid (Chetlin *et al.*, 2009) Hypertriglyceridemia is associated with an increased risk of cardiovascular events and acute pancreatitis (Oh and Brain, 2007).

The incidence of hypertriglyceridemia increases with poor glycaemic control and prolonged duration of diabetes mellitus (Parvez *et al.*, 2010).

Results in diabetes and pre-diabetic group also were identical with another study noted that patients with diabetes and pre-diabetes often have a dyslipidemic feature of metabolic syndrome. Classic diabetic dyslipidemia characterized by elevated triglycerides, decreased high density lipoprotein (HDL) cholesterol and low density lipoproteins (LDL) particles of altered composition (Aslam *et al.*, 2007).

Some research noted that hypothyroidism, like obesity is one of the pathophysiological conditions most frequently associated with disorders of lipid metabolism and finally dyslipidemia is one of the major risk factors of coronary disease (Limbu *et al.*, 2008; Shashi *et al.*, 2013).

## CONCLUSION

As it seen from the results that hypothyroid patients have dyslipidemia in their blood serum because there were significant differences in lipids profile (TC, TG, HDL-C, LDL-C, VLDL-C) when compared them to control group, therefore it is recommended to carry out examination of lipids profile in the sera of these patients from the beginning of diagnosis of disease to manage it and prevent the situation from progress to diabetes.

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