

Lipid Abnormalities among Type II Diabetic Patients in Kirkuk City

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Abstract:

Background: Lipid abnormalities are common in diabetic patients and associated with accelerated atherosclerosis and increased risk of coronary artery disease, this study was carried out to determine the degree of lipid abnormalities among type II diabetic patients in Kirkuk City.

Patients and Methods: One hundred twenty patients with type II diabetes and (120) control group (non-diabetic) who attended Azadi Teaching Hospital in Kirkuk City from November 2012 to October 2013 were included in the study. Demographic features recorded and the level of fasting: blood sugar, total cholesterol, triglyceride (TG), high density lipoprotein (HDL), low density lipoprotein (LDL) and very low density lipoprotein (VLDL) was measured.

Results: Patients with type II diabetes mellitus (DM) showed statistically significant lipid abnormalities when compared with the control group. Overall lipid abnormalities were detected in (55%) of patients with type II DM. Those with poor glycemic control showed significantly higher lipid abnormalities than patients with fair glycemic control. We found no statistically significant difference in lipid abnormalities in relation to the duration of diabetes mellitus.

Conclusion: Outcome of this study showed that a high proportion of patients with type II DM have some forms of derangement in their lipid profile and is correlated with poor glycemic control.

Key words: Hyperlipidemia, Type II diabetes mellitus, Azadi teaching hospital, Kirkuk

Introduction:

Type II diabetes mellitus (DM) is associated with the development of premature atherosclerosis and higher cardiac morbidity and mortality^(1,2,3). Hyperlipidemia is a strong predictor risk of cardiovascular events in diabetics⁽⁴⁾, diabetic dyslipidemia is believed to play an important role in the pathogenesis of accelerated atherosclerosis in this condition^(5,6).

The predominant lipid abnormalities in diabetic patients are an elevated serum triglyceride (TG) level and lower high density lipoprotein-cholesterol (HDL-C) level⁽⁷⁾. Many features of diabetic dyslipidemia can be explained by reduced action of insulin at the tissue level. This could be due to insulin

resistance, although relative insulin deficiency associated with pancreatic beta-cell dysfunction also contributes⁽⁸⁾. The lipid abnormalities are present in DM because insulin resistance or insulin deficiency affect key enzymes and pathways in lipid metabolism, in particular the following processes are affected: apoprotein production, regulation of lipoprotein lipase, action of cholesteryl ester, transfer protein and hepatic and peripheral action of insulin⁽⁹⁾.

It has been proposed that the composition of lipid particles in diabetic dyslipidemia is more atherogenic than other types of dyslipidemia, this means that even normal lipid concentration

might be more atherogenic in diabetic than in non-diabetic people⁽¹⁰⁾. Some studies have indicated that elevated triglyceride level is an independent risk factor and a predictor for the development of coronary artery disease especially in type II diabetes mellitus⁽¹¹⁾. Frequent coexistence of hypertriglyceridemia and low HDL poses a greater risk for coronary artery disease development⁽¹²⁾.

The aim of this study is to evaluate the patient's data and their lipid profile in comparison with normal control group and to assess the specific lipid pattern in type II diabetic patients in Kirkuk city.

Patients and Methods:

A total of (120) patients with type II DM who attended Azadi Teaching Hospital in Kirkuk City from 1st of November 2012 to 1st of October 2013 were included in this study. All diabetic patients were treated by antidiabetic drugs and were not receiving lipid lowering agents. A control group was included that consisted of 120 age and sex matched non-diabetic subjects who were not suffering from an acute illness or a metabolic disease that affects blood lipids and had no family history of hypercholesterolaemia.

Patients with factors that affect blood lipid such as hepatic and renal disease, alcohol intake and those using drugs such as thiazide diuretics and oral contraceptive pills were excluded from this study.

The aims, nature and procedures of the study were fully explained to the potential study population and a clear verbal consent was obtained.

Data collected from patients included age, sex, duration of DM (< and \geq 10 years) and type of antidiabetic drug therapy.

Blood samples were drawn from the patients and control group with an overnight fasting (> 12 hours) and before morning medications for fasting blood glucose and lipid study (total cholesterol, triglyceride, HDL-C, low density lipoprotein-cholesterol (LDL-C) and very low density lipoprotein-cholesterol (VLDL-C).

Total cholesterol, TG, HDL-C and LDL-C were measured using commercial kits and VLDL-C was calculated according to the following formula:

$$\text{VLDL-C} = \text{TC} - (\text{LDL-C} + \text{HDL-C})$$

Patients with fasting blood glucose < 144mg/dl considered as having fair glycemic control and \geq 144mg/dl as poor glycemic control⁽¹³⁾.

Normal values of fasting lipid profile were taken as the following: total cholesterol desirable <200mg/dl, TG <150 mg/dl, HDL-C > 40 mg/dl, low density lipoprotein-cholesterol near optimal <130 mg/dl. (ATP 3 guidelines)⁽¹⁴⁾.

Student t test was used to estimate differences in lipoprotein level between the studied groups and a P-value of 0.05 or less was considered statistically significant.

Results:

Table (1) shows the demographic characteristic of the (120) patients with type II DM and the (120) healthy controls according to age and sex. In the diabetic group, 56 patients (46.7%) were male and 64 (53.3%) were female while in the control group 55(45.8%) were male and 65(54.2%) were female.

Regarding age distribution in the diabetic group 36(30%) were in the age group (40-49) years, 42(35%) were in the age group (50-59) years and 42(35%) were 60 years and above. While in the control group 37 (30.8%)

of them were in the age group (40-49), while 41 (34.2%) in the age (50-59) years and 42(35%) 60 years and above.

Table 2 shows the lipid profile in the diabetic and control groups, total cholesterol, TG, LDL and VLDL was significantly higher than the control group whereas the level of HDL was significantly lower than the control group.

Table 3 shows the percentage of specific lipid abnormalities in patients with type II DM, a raised total cholesterol was observed in 4(35%) of patients, raised total TG was seen in 54(45%) of patients, raised LDL was found in 30(25%) of patients, and a decreased HDL was seen in 48(40%) of patients. Overall abnormal lipid

abnormalities were seen in 55% of patient with type II DM.

Table 4 compares the lipid profile between fairly and poorly controlled diabetic patients. Patients with poor glycemic control showed significantly higher level of total cholesterol, TG, LDL and VLDL compared to patients with good glycemic control, also patients with poor glycemic control showed statistically significant lower level of HDL than patients with good glycemic control.

Table 5 compares lipid profile according to the duration of DM, there was no statistically significant difference between those patient with DM<10 years and those patients \geq 10 years.

Table (1): Demographic data of patients and control.

| Demographic data | Patients No. (%) | Control No. (%) |
|------------------|------------------|-----------------|
| Gender | | |
| Male | 56(46.7%) | 55(45.8%) |
| Female | 64(53.3%) | 65(54.2%) |
| Age | | |
| 40-49 years | 36(30%) | 37(30.8%) |
| 50-59 years | 42(35%) | 41(34.2%) |
| \geq 60 years | 42(35%) | 42(35%) |

Table (2): Lipid profile in diabetic patients and control.

| Lipid | Type II DM Mean(SD) | Control Mean(SD) | P-Value |
|-------------------|---------------------|------------------|---------|
| Cholesterol mg/dl | 220(31.2) | 202(30.8) | <0.005 |
| HDL mg/dl | 32(12.9) | 46(15.6) | <0.01 |
| LDL mg/dl | 138(28.5) | 120(27.8) | <0.005 |
| VLDL mg/dl | 50(10.1) | 36(11.2) | <0.005 |
| TG mg/dl | 250(38.3) | 185(36.4) | <0.005 |

Table (3): Shows the percentage of specific lipid abnormalities in patients with type II DM.

| Lipid abnormalities | No. of diabetic patients | Percentage (%) |
|--------------------------------|--------------------------|----------------|
| Raised cholesterol (>200mg/dl) | 42 | (35%) |
| Raised TG (>150mg/dl) | 42 | (35%) |
| Decreased HDL (<40mg/dl) | 30 | (25%) |
| Raised LDL (>130mg/dl) | 36 | (30%) |
| Overall Lipid abnormalities | 66 | (55%) |

Table (4): Compare the lipid profile between fairly controlled and poorly controlled diabetic patients.

| Lipid | Fair glycemic control FBG<8 mmole/L(144mg) Mean(SD) | Poor glycemic control FBG≥8 mmole/L(144mg) Mean(SD) | P-Value |
|-------------------|---|---|---------|
| Cholesterol mg/dl | 208(30.4) | 235(31.2) | <0.005 |
| HDL mg/dl | 48(11.6) | 35(10.6) | <0.005 |
| LDL mg/dl | 120(28.4) | 150(29.7) | <0.01 |
| VLDL mg/dl | 45(11.2) | 55(12.3) | <0.005 |
| TG mg/dl | 225(32.4) | 275(33.6) | <0.005 |

Table (5): Compare lipid profile according to the duration of DM.

| Lipid | Duration of DM<10 years Mean(SD) | Duration of DM≥10 years Mean(SD) | P-value |
|-------------------|-------------------------------------|-------------------------------------|---------|
| Cholesterol mg/dl | 217(26.7) | 223(28.3) | NS |
| HDL mg/dl | 44(12.4) | 42(12.6) | NS |
| LDL mg/dl | 128(25.5) | 132(26.1) | NS |
| VLDL mg/dl | 48(11.2) | 52(12.2) | NS |
| TG mg/dl | 240(23.6) | 260(26.4) | NS |

Discussion:

DM is associated with greater risk of morbidity and mortality from cardiovascular disease, detection and treatment of dyslipidemia in DM is one major step towards reducing the risk of cardiovascular disease in patients with DM⁽¹⁵⁾. Hellman et al. have demonstrated that intensive treatment for diabetes markedly lowers the cardiovascular mortality due to diabetes mellitus⁽¹⁶⁾.

This study shows that patients with type II DM have a statistically significant higher prevalence of lipid abnormalities

than healthy control. Insulin resistance is an important factor in patients with type II DM which leads to increased release of free fatty acids from fatty tissue, impaired insulin dependent uptake of free fatty acid and increased fatty acid release to the hepatic tissue which is linked to great risk for vascular disease⁽¹⁷⁾.

This study shows that the overall lipid abnormalities in patients with type II DM was (55%), this figure is close to two other studies done in Kuwait and Nigeria^(18,19), whereas other studies

showed that (70%) of American and (85%) of the Finnish diabetic patients were reported to have lipid abnormalities^(20,21). This difference may be related to dietary habits and extent of obesity⁽²²⁾, genetic factors of the population⁽²³⁾ and lack of physical activity⁽²⁴⁾.

Regarding the type of lipid abnormalities, elevated LDL was found in (30%) of the patient, a similar result was obtained in other studies^(25, 26,27,28). Elevated TG was seen in (35%) of the diabetic patients and similar results was seen in other studies^(26, 29), elevated total cholesterol level was found in (35%) of patients, this result is comparable with another study done⁽³⁰⁾. A low HDL level was seen in (25%) of our patients and this result was demonstrated in other studies⁽³¹⁾.

Also this study showed a significant association between poor glycemic control and lipid abnormalities, the positive improvement in lipid profile with fair glycemic control is evident from many studies⁽³²⁾. Hyperglycaemia is closely related to hypercholestraemia, elevation in LDL and hypertriglyceridemia⁽³³⁾. It was found that diabetic patients with lack of diabetic control have higher lipids and low HDL, consequently they were at a high risk of developing coronary heart disease⁽³⁴⁾. The main reason for uncontrolled type II diabetics, not reaching target goals may be lack of education and patient will to control higher blood sugar level. Reasonable education of diabetics to achieve acceptable control is well validated and to be stressed on in every visit⁽³⁰⁾.

This study shows no statistical significant in lipid parameter between those patient with DM<10 years and those patients with DM≥10 years, there

is a dissociation between duration of diabetes and dyslipidaemia. In fact the occurrence of dyslipidaemia depends on factors such as insulin action on peripheral tissues and liver, apoprotein production and regulation of lipoprotein lipase and the duration of diabetes seems to play only a minor role in modifying these factors⁽⁹⁾.

Conclusion:

This study showed a high prevalence of lipid disorders among diabetic patients in Kirkuk. There was a marked association between lipid disorders and glycaemic control. The high prevalence of lipid disorders in this study suggests that they might be playing a major role in the development of atherosclerosis in diabetic patients. The optimal care of diabetic patients should include periodic screening for lipid abnormalities. Aggressive lifestyle changes, such as weight reduction and physical exercise should be initiated first. Addition of lipid-lowering drugs should be considered if such changes do not achieve effective lipid control. The optimum treatment with antidiabetic drugs to obtain fair glycemic control should go hand-by-hand with lipid-lowering drugs.

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