

Dyslipidemia in patients with type 2 diabetes: Is there any difference among our patients?

Muhammad Imran Javid, Hina Shajee

Bi Sulaiman Medical Abu Dahbi UAE and Qateef Central Tertiary Care Teaching Hospital Damam, Saudi Arabia

Objectives: To determine the frequency of dyslipidemia among type 2 diabetics and to assess patterns of dyslipidemia in these patients.

Methodology: This cross sectional study was conducted in the Department of Medicine, Qateef Central Hospital, Dammam, Saudi Arabia from August 29, 2012 to February 28, 2013. Patients with type 2 diabetes were selected and 14 hours fasting blood sample was collected for lipid profile.

Results: A total of 250 patients were included in the study. The overall frequency of dyslipidemia was 76%. One hundred and fifty seven (62.8%) patients were found to have hypertriglyceridemia,

91(36.4%) had LDL-C and 25(10%) had HDL-C derangements. Major proportions of these patients (34.8%) had two lipid values outside of their target levels. Second common pattern included derangement of three lipid values (22.4%) followed by one (17.6%).

Conclusion: Dyslipidemia is common among patients with type 2 diabetes mellitus with majority of them having a combined dyslipidemia. (Rawal Med J 201;42:8-12)

Key words: Dyslipidemia, Type 2 diabetes mellitus, hyperlipidemia.

INTRODUCTION

Diabetes mellitus is a complex metabolic process and a growing epidemic throughout the world.¹⁻³ It is characterized by absolute or relative insulin deficiency and or insulin action leading to hyperglycemia as well as disturbances of carbohydrate, protein and lipid metabolism.⁴ Cardiovascular disease (CVD) is the leading cause of death worldwide and mortality due to CVD is higher in low and middle-income countries.⁵ Dyslipidemia has been closely linked to the pathophysiology of CVD, as subjects with diabetes have a greatly increased risk of coronary heart disease, which is only partially related to their elevated glucose.⁶ Other factors such as insulin resistance and dyslipidemia are likely to be important. Cardiovascular disease is a significant cause of morbidity and mortality in diabetic patients and now recognized as a risk equivalent for coronary heart disease.⁷ The type of dyslipidemia that is most characteristic of type 2 diabetic subjects is elevated triglycerides and decreased HDL cholesterol levels, although all lipoproteins have compositional abnormalities.⁶

Atherosclerotic complications are the leading cause of death in people with diabetes. Therefore, identifying risk factors, such as lipid abnormalities, that explain their cardiovascular risk is essential. Available studies suggest that low HDL cholesterol may be the most important risk factor for coronary heart disease,⁸ while LDL reduction with statins has led to significant reductions in coronary heart disease incidence.^{8,9} In addition, overall mortality was reduced with statin therapy. The aim of the present study was to highlight this important risk factor by assessing the frequency and patterns of dyslipidemia among patients with type 2 diabetes.

METHODOLOGY

This cross sectional study was conducted in the Department of Medicine at Qateef Hospital, Dammam, Saudi Arabia from 29th August 2012 to 28th February 2013. Patients with type 2 diabetes both male and female attending the out patients department were selected on the basis of pre-determined criteria with their informed consent. The data collected contained demographic information (age and gender), age of onset of diabetes (in years),

duration of diabetes (in years), treatment (oral hypoglycemic, insulin or both) and its compliance (regular or irregular). Main outcome measures were frequency and pattern of dyslipidemia in type 2 diabetes mellitus patients. Patients with Familial lipid disorders, hypothyroidism, Cushing's syndrome, acromegaly, end stage renal disease, nephrotic syndrome, obesity and those using lipid lowering therapy were excluded from the study. Convenient sampling method was used and data assessed in a prospective manner.

Fasting blood sugar, HbA1c, plasma lipid profile including total lipid (TL), total cholesterol (TC), triglyceride (TG), low density lipoprotein (LDL) and high density lipoprotein (HDL) were measured. Fasting blood samples (12-14 hours) were analyzed for serum triglycerides and total cholesterol, using automated chemistry analyzer. HDL-C was determined by precipitation method and LDL-C and VLDL-C were estimated by Friedewald's formula. Current American Diabetes Association (ADA) definitions¹⁰ and ATP III guidelines¹¹ (Table 1) were used to label patients as type 2 diabetics and to classify lipoprotein concentrations into different cardiovascular disease risk categories respectively. Because ADA guidelines recommend an LDL of <100 mg/dl, a triglyceride levels of <150 mg/dl, and an HDL cholesterol level of >40 mg/dl in men and >50 mg/dl in women, the percentage of patients who had none, one, two, or all three of these lipoprotein not at goal levels were also determined. Patterns of dyslipidemia were defined into none, one, two, three or four types depending on derangement of any of the above lipid values from their target levels. SPSS version 10 was utilized for statistical analyses.

RESULTS

A total of 250 patients (134 male, 116 female) were included in the study. The age range was between 30 to 68 years (mean 50.29±9.32 years). Majority of the patients were between 56 to 60 years of age. Mean age of onset of diabetes was 36.34±6.98 years, with mean duration of 14±5.83 years. Majority (90%) was taking oral hypoglycemic for control of their diabetes. Only 25(10%) patients were on both insulin and oral hypoglycemic therapy. Mean HbA1c level was 10.3±2.7% (Table 2).

Table 1. ATP III Classification of Dyslipidemia. (11)

LDL-Cholesterol (mg/dl)	
<100	Optimal
100-129	Near optimal/above optimal
130-159	Borderline high
160-189	High
>190	Very high
Total Cholesterol (mg/dl)	
<200	Desirable
200-239	Borderline High
>240	High
HDL cholesterol (mg/dl)	
<40	Low
>60	High
Triglycerides (mg/dl)	
<150	Normal
150-199	Borderline high
200-499	High
>500	Very High

Table 2. Baseline Characteristics of study population.

Variable	Value
Number of patients	250
Gender	
Female	116
Male	134
Mean age(years)	50.29±9.32
Age of onset of Diabetes(years)	36.34±6.98
Mean duration of diabetes(years)	14±5.83
Treatment	
Oral hypoglycemic agents	225 (90%)
Oral plus insulin	25 (10%)
Mean HBA1C	10.3±2.7

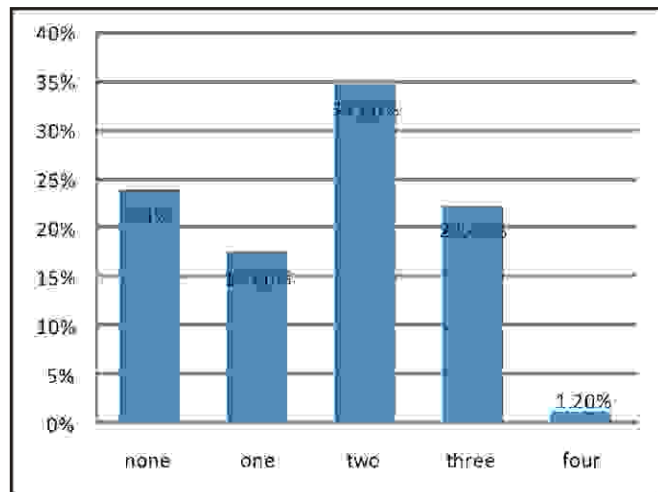
Table 3. Lipid profile of study participants.

Parameter (mg/dl)	n (%)	Mean±SD
	129 (51.6%)	206.44 (48.31)
Triglycerides (>150)	157 (62.8%)	191.66 (81.82)
LDL-C(>130)	91 (36.4%)	119.29 (37.27)
HDL-C (<40)	25 (10%)	41.14 (10.02)

Out of 250 cases, 129(51.6%) of patients had high level of plasma cholesterol level i.e. above 200 mg/dl with mean level of 206.44±48.31 mg/dl. LDL-C was optimal (i.e. within reference range) in

158(63.2%) of cases whereas 92(36.8%) patients showed high LDL-C level in this study. Mean LDL-C level was 119.29 ± 37.27 mg/dl.

Figure 1. Pattern of Dyslipidemia.



Normal triglyceride level (i.e. up to 150 mg/dl) was found in 93(37.2%) patients whereas 157(62.8%) cases showed high triglyceride levels. Mean triglyceride level was 199.66 ± 81.82 mg/dl. Low HDL cholesterol level was observed in 25(10%) of patients only. Mean HDL-C level was 41.14 ± 10.02 mg/dl (Table 3). Out of 250 cases, only 60(24%) patients had all lipid values within the respective target level; while, 190(76%) demonstrated dyslipidemia. Critical analysis of patterns of dyslipidemia revealed 44(17.6%) had one, 87(34.8%) had two, 56(22.4%) had three and 03(1.2%) had all four lipid values outside of target level (Figure 1).

DISCUSSION

The results of this study demonstrated that majority of type-2 diabetics (76%) had dyslipidemia. Furthermore, majority of these patients (34.8%) had two lipid values outside of their target levels. Second common pattern included derangement of three lipid values (22.4%) followed by one (17.6%). Few patients (1.2%) showed all four lipid values abnormalities. Diabetes is considered as an independent risk factor for cardiovascular disease, and cardiovascular outcomes are less favorable than those without diabetes.^{7,8,12}

Hypertriglyceridemia constitutes the commonest lipid abnormality seen in our diabetic patients, followed by low serum HDL levels. Similar results are observed in other studies.¹³⁻¹⁵ Raised LDL cholesterol was least frequent. Another study from Pakistan also showed hypertriglyceridemia to be the most common component of diabetic dyslipidemia.¹⁶ In this study, mean levels of TG was 352.54 ± 181.47 mg%. Naheed et al also encountered marked hypertriglyceridemia in their case series.¹⁷ Two different studies from India showed the prevalence of dyslipidemia in hyperglycemic patients as 89% and 92.4%.^{18,19} Therefore, raised triglyceride levels are considered to be the most important determinant of coronary heart disease of type 2 diabetic patients and physicians should be vigilant in making an early diagnosis of this.

Contrary to this, derangements of LDL-C and HDL-C vary among different studies. Al-Adasni et al²⁰ encountered hypertriglyceridemia with low HDL-C levels and variable LDL-C levels in Kuwaiti diabetic patients. Agarwal et al¹⁸ reported elevated levels of triglycerides and low levels of HDL-C as a most common pattern of dyslipidemia. In this study, derangements of LDL-C and HDL-C were encountered in 36.4% and 10% of cases, respectively, which is nearly comparable to the results of above mentioned studies. Al-Adsani and Suresh²⁰ also observed more deranged levels of LDL-C as compared to high density lipoproteins in their case series.

Although the type of dyslipidemia among diabetics differs, patterns of having these abnormalities are similar worldwide. The frequency of two lipid values outside of their target levels was significant in our study i.e. 34.8%. Second common pattern included derangement of three lipid values (22.4%) followed by one (17.6%). Few patients (1.2%) showed all four lipid values abnormalities in this study. Al-Adsani and Suresh²⁰ noticed majority of patients (46%) having two lipid values derangement followed by one (31%) and all three values (16%) in their series. Ahmed et al²¹ and Sarfaraz et al²² also encountered two lipid values outside of their target levels in majority of patients. Combined dyslipidemia was also found in various studies.¹⁸⁻²²

While initiation of drug therapy based on differences in the lipid profile is an option, most practice guidelines recommend statins as first-line therapy.¹⁰ The ADA has made recommendations for both medical nutrition therapy (MNT) and physical activity. MNT should be attempted before starting pharmacological therapy. Diabetic patients who are overweight should be advised for increased physical activity.¹⁰ The mean HbA1C of our patients was 10.3 indicating uncontrolled diabetes. While there is a consensus to initiate insulin if blood sugars are not controlled despite treatment, majority of patients refused insulin, which maybe another confounding factor in high levels of dyslipidemia in our patients.

While our study provides useful data regarding frequency and pattern of dyslipidemia, this study has several limitations. The data was not compared with a similar group of patients without diabetes to allow comparison with subjects in this study. Data regarding dietary intake, physical activity and socioeconomic status was also not available which may affect the lipid profile of our diabetic patients. However, data like our study will be necessary for the future comprehensive cardiovascular disease risk reduction programs in patients with diabetes.

CONCLUSION

Dyslipidemia is common among patients with type 2 diabetes mellitus, with majority of the patients having a combined dyslipidemia. High Triglycerides with low HDL levels was the commonest presentations. Therefore, complete lipid profile should be evaluated and dyslipidemia should be treated to reduce cardiovascular morbidity and mortality among patients with type 2 diabetes.

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Conception and design: MIJ
 Collection and assembly of data: MIJ, HS
 Analysis and interpretation of the data: MIJ, HS
 Drafting of the article: MIJ
 Critical revision of the article for important intellectual content: MIJ, HS
 Statistical expertise: MIJ, HS
 Final approval and guarantor of the article: MIJ, HS
Corresponding author email: Dr. Muhammad Imran Javid: imranjavidleo78@yahoo.com
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