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Poor Lipid Control in Type-2 Diabetics With and Without Ischemic Heart Disease

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To determine the frequency of type-2 diabetics who have target lipoprotein blood levels, to study these levels in patients with ischemic heart disease and cardiovascular disease risk factors, and to study the possible causes of poor control, we reviewed hyperlipdemic type-2 diabetics who were on regular follow up to the medical outpatient clinic of King Abdulaziz University Hospital from January 2000 to January 2001. A total of 202 patients were studied with mean age of 60 yr and equal male to female ratio. The mean duration of diabetes was 10 yr and it was 7 yr for hyperlipidemia. The mean level of LDL was 3.15 mmol/L and it was 1.0 mmol/L and 2.47 mmol/L for HDL and TG, respectively. Only 31% of patients had LDL < 2.6 mmol/L, 28% had HDL > 1.1 mmol/L, and 37% had TG < 1.7 mmol/L. No significant difference was found in the frequency of target level of LDL in patients with IHD and those without; 26% vs 34% (0.4). Similarly, no difference was found in those with hypertension, obesity, and patients with family history of IHD compared to those without these risk factors; 30%, 26%, 16% vs 34%, 36%, 33% (p = 0.2, 0.1, 0.4, respectively). Males were found to have a higher frequency of target LDL level compared to females; 38% vs 25% (p = 0.04). Poor diet restriction was found in 90% of patients' with poor control, lack of patients' knowledge in 62%, 70% have financial reasons, 86% of patients on multiple medications, and in 16% the treating physician took no proper action. In conclusion, a low frequency of type-2 diabetics have target levels of lipoproteins. Diabetics with IHD and CVD risk factors also have poor lipid control. Poor control was associated with poor diet compliance and use of multiple medications. Proper management and control of this disease is needed among elderly patients.

Key Words: Type-2 diabetics; dyslipidemia; control.

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Introduction

Diabetes mellitus (DM) is one of the most common endocrine disorders. It is closely associated with coronary heart disease (CHD) *(1)*. Diabetes is associated with two- to four-fold excess risk of CHD *(2)*. Eighty percent of patients with type-2 diabetes will die of cardiovascular diseases *(3)*. The most common pattern of dyslipidemia in diabetics is elevated triglyceride (TG), low high density lipoprotein (HDL) cholesterol, and predominance of small dense particle low density lipoprotein (LDL). Baseline data from the UKPD (United Kingdom Prospective Diabetes) Study showed that both low HDL and elevated LDL predicted CHD *(4)*. According to the American Diabetes Association (ADA) recommendations *(5)*, the treatment goal for lipoprotein therapy in diabetics is as follow: LDL < 2.6 mmol/L, HDL > 1.1 mmol/L, TG < 1.7 mmol/L. In our study we determined the frequency of type-2 diabetics who have target lipoprotein blood levels, studied these levels in patients with ischemic heart disease and cardiovascular disease risk factors, and studied the possible causes and solutions of poor control.

Results

A total of 202 patients were included in this study. The mean age was 59.9 ± 12.9 yr with equal male to female ratio and mean duration of diabetes 10.3 ± 7 yr. Most of the patients were using oral hypoglycemic agents for blood glucose control followed by insulin and diet; 121/202 (60%), 59/202 (29%), 22/202 (11%), respectively. The majority of patients, 190/202 (94%), have poor blood glucose control. The mean duration of hyperlipidemia was 6.6 ± 1.7 yr. Hypertension, obesity and (IHD) were found with high frequency in the study group (Table 1). Twelve of 202 patients (6%) had goal levels for all lipoproteins A low frequency of diabetics had goal levels of individual lipoprotein (Table 2). As shown in Figs. 1–4, both patients with CHD, CHD risk factors, and those without, have poor target lipoprotein levels. Males are more likely to have target LDL compared to females. A significant relation was found between poor lipid control and long duration of hyperlipidemia; mean duration of hyperlipidemia in patients with poor control was 6.9 ± 1.8 yr vs 5.2 ± 1.4 yr in those with good control

Table 1
Some Characteristics of the Study Group

Variable	Total number = 202 *n* (%)
Ischemic heart disease	81 (40)
Hypertension	140 (69)
Duration of hypertension in years (mean ± SD)	8.25 ± 6.8
Body mass index in kg/m^2 (mean ± SD)	29.3 ± 6.3
<30 kg/m^2	121 (60)
>30 kg/m^2	81 (40)
Smoking	37 (18)
Family history of ischemic heart disease	38 (19)
Mortality	17 (8)

Table 2
Lipoproteins Blood Levels

Lipoprotein type	Lipoprotein level *n* (%)
LDL in mmol/L (mean ± SD)	3.15 ± 1.9
<2.6 mmol/L	62 (31)
2.6–3.4 mmol/L	60 (30)
>3.4 mmol/L	80 (39)
HDL in mmol/L (mean ± SD)	1.0 ± 0.29
>1.1 mmol/L	57 (28)
<1.1 mmol/L	145 (72)
Triglyceride in mmol/L (mean ± SD)	2.47 ± 1.9
<1.7 mmol/L	75 (37)
>1.7 mmol/L	127 (63)

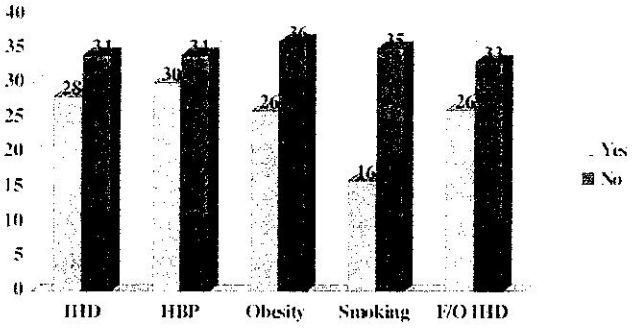

Fig. 1. Target for LDL-c in patients with and without ischemic heart disease and cardiovascular risk factors (target LDL-c < 2.6 mmol/L). *p* value significant for smoking. IHD, ischemic heart disease; HBP, hypertension; F/O IHD, family history of ischemic heart disease.

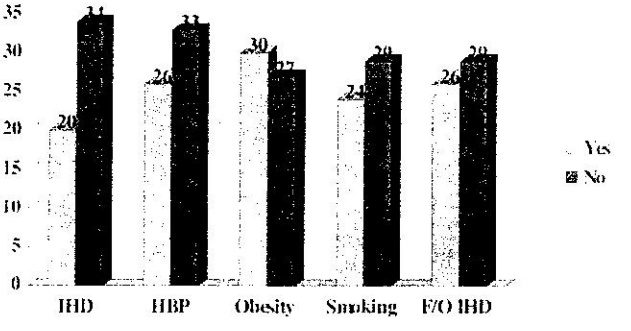

Fig. 2. Target for HDL-c in patients with and without ischemic heart disease and cardiovascular risk factors (target HDL-c > 1.1 mmol/L). *p* value significant for IHD. IHD, ischemic heart disease; HBP, hypertension; F/O IHD, family history of ischemic heart disease.

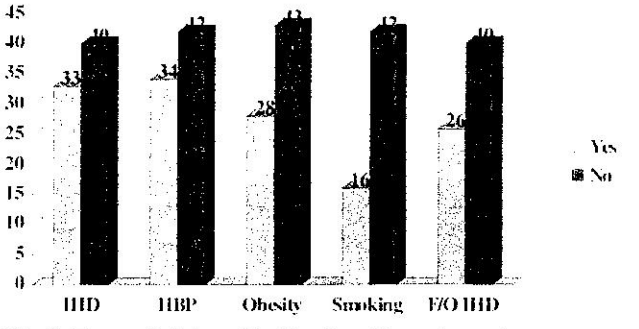

Fig. 3. Target of triglyceride blood level in patients with and without ischemic heart disease and cardiovascular risk factors (target triglyceride < 1.7 mmol/L). *p* value significant for obesity and smoking. IHD, ischemic heart disease; HBP, hypertension; F/O IHD, family history of ischemic heart disease.

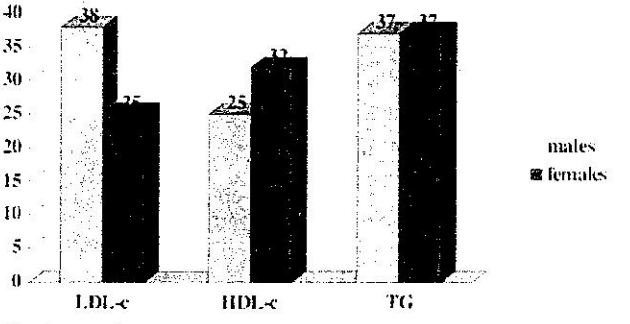

Fig. 4. Relation of target lipoprotein blood levels to sex (target LDL-c < 2.6 mmol/L; target HDL-c > 1.1 mmol/L; target T.G < 1.7 mmol/L). *p* value significant for LDL-c. LDL-c, low density lipoproteins cholesterol; HDL-c, high density lipoproteins cholesterol; TG, triglyceride.

($p = 0.004$). Also, patients with poor glycemic control has poor lipid control; 60/190 (32%) patients with poor blood glucose control had goal level of LDL, 70/190 (37%) goal TG, 52/190 (27%) goal HDL vs 130/190 (68%), 120/190 (63%) had high LDL, TG, and 138/190 (73%) had low HDL levels, respectively ($p < 0.001, 0.02, 0.001$, respectively) Most of the patients, 112/202 (55.4%), were not taking pharmacological treatment for lipid control, while those on statin were 66/202 (32.7%), on fibrates 18/202 (8.9%), and on combined statin and fibrates 6/202(3%). Results of patient interviews showed that 170/189 (90%) had poor diet restriction, 117/189 (62%) had little knowledge of diabetic complications and the importance of lipid control, 132/189(70%) could not afford to buy medications, 162/189 (86%) were

taking more than 3 tablets/d, and in 30/189 (16%) no proper action was taken by the treating physician.

Discussion

Diabetes is rapidly becoming a major public health problem worldwide *(2)*. A study conducted by Mokdad et al. *(6)* detected a 33% increase in the prevalence of diabetes in adults across all age groups, races, education levels, weight levels, and levels of smoking over an 8-yr period (1990–1998). Type-2 diabetes is a progressive disease, and it is an independent risk factor for CHD. Patients with diabetes and no previous history of IHD have the same risk for cardiac events as patients with previous myocardial infarction *(1)*. It is also associated with a combination of CVD risk factors including hypertension, high LDL, low HDL, high TG, and abdominal obesity, which are primarily attributed to insulin resistance *(7–9)*. Patients with type-2 diabetes have an increased prevalence of lipid abnormalities that contribute to the high rate of CVD. The Framingham Offspring study had shown that there is twice the prevalence of low HDL, high TG, high LDL in diabetics compared to nondiabetics *(10)*. Clinical research has found that these lipid abnormalities to be an independent risk factor for CHD in diabetics *(11,12)*. It is clear in our study that a minority of diabetics had goal lipoprotein level, only 6% had goal levels for all lipoproteins. Thirty-one percent had goal LDL levels. Similar results had been reported by Saaddine et al. *(13)* and others *(14–16)*. High LDL level was evident in diabetics with CHD risk factors where they are supposed to have better care because of their high risk. Our findings represent a challenge for health care providers in diabetes control. Poor lipid control was associated with long duration of hyperlipidemia and poor glucose control. As it is clear in our study, a majority of patients (86%) were taking multiple medications. This means that patients may get frustrated with the chronic use of multiple medications. It is easy for the physicians to tell a patient to take 5, 6, or 7 different pills up to 3 three times per day, but for the patient it will be an inconvenient and tedious task; thus, the use of combined slow-release tablets is warranted. In this study around 70% of the patients had financial problems in buying multiple medications. This might be related to lower economic standards; since the mean age of these patients is 60, they could be either retired or out of jobs, and, unfortunately, there is no health insurance system to cover their medical expenses. Governmental health centers that provides medical services to the general community, including KAUH, do not supply these medications free of charge. There is a need to improve the health care system, and the free supply of these medications to the diabetic patients with hyperlipidemia might help. Until 1990, most of the diabetics in Saudi Arabia were commonly treated at hospital level. It was in 1994 when the Kingdom approved the guidelines and standards of diabetic care at the primary health care level through a Scientific Quality Assurance Committee *(17)* to offer diabetic care. Khattab et al. and others *(18–20)* conducted audit studies in central and southern regions of Saudi Arabia which confirmed that establishment of mini-clinics for diabetic care at primary health care centers with a free supply of medications showed improved process and outcome of diabetic care. Organizations that purchase health care benefits for their members or employees should insist that self-management education, medications, and supplies be included in the services provided and managed care organizations should include these services and supplies in the basic plan available to all participants.

In addition, the study showed a striking observation regarding the presence of better lipid control in males compared to females patients, which is similarly observed in other studies *(13,14)*. Other studies had also shown a lower risk of death attributed to IHD in diabetic males compared to females *(21)*. This differences might be related to poor quality of care in diabetic females, such as lack of physical activity, changes of dietary life styles, and the lack of education. Background information regarding socioeconomic standards of the diabetic patients and its compliance with medications is very important. Further studies are needed in this aspect for the community in general.

Lipid management had been shown to reduce the risk of CHD by 25% to 55% and the risk of death by 43% *(22,23)*. In our study in 16% of the patients the treating physician did not take proper action. Almost half of the patients were not on any pharmacological therapy and statins were the most frequently used medication. In three secondary prevention studies using statins, diabetics achieved significant reduction in coronary events *(23–25)*. A primary prevention study also using statins showed similar trends of reduced events *(26)*. The Helsinki Heart Study–the Veterans Affairs High-Density Lipoprotein Cholesterol Intervention Trial (VA-HIT) also showed reduction in CHD events using fibrate *(27,28)*. It is clear from our study and other studies that lipid control is suboptimal in diabetics. There is a gap between ADA recommendations and their clinical application. Patients with diabetes often lack sufficient knowledge about their disease and its complications. Around 62% of the patients lack this knowledge. The management of diabetes mellitus is a team effort, the cornerstone is the patient. The provision of diabetic-care health care pamphlets had been shown to be improved after introduction of mini-clinic on diabetes care *(20)*. A prospective study by Wooldridge et al. *(29)* demonstrated improved metabolic control after intensive individual education. VHA (Veterans Health Administration) recommend reassessing patient's knowledge about diabetes at least 3 mo after educational intervention *(30)*. Programs to improve diabetic's knowledge about the importance of controlling hyperlipidemia will allow them to better contribute to their care, and the benefit of these programs should be reassessed. As articulated by Anderson and Funnel *(31)* the goal should be to help

educate, motivate, and empower patients to improve their self-care skills and take control of their disease rather than supply foster adherence to prescribed medications. Reinforcement and encouragement of physicians for better follow up and more aggressive management of hyperlipidemia is warranted, as physicians are the logical locus of intervention to improve patient's adherence. To reach diabetes treatment goals, physicians should also have access to all classes of medications used in diabetes treatment, equipment, and supplies without undue controls.

Method

The study was carried out at King Abdulaziz University Hospital (KAUH), a teaching hospital, like other governmental hospitals and primary health centers, provides medical services to the general community in the western province of the kingdom of Saudi Arabia. A random sample of 202 diabetic type-2 patients were selected to participate in this study, as they were seen regularly for follow up at the medical outpatient clinics in KAUH during a 1 yr period—January 2000 through January 2001. Patients with dyslipidemia (defined as patient with known hyperlipidemic or has LDL > 2.6 mmol/L, HDL < 1.1 mmol/L, and TG > 1.7 mmol/L) were included in the study. For those who were recently discovered, they were reassessed after a 6 mo period. The mean lipoprotein levels of the last two visits were calculated and the duration of hyperlipidemia and type of treatment (diet, statin, fibrates, or combined) were recorded. Demographic data were collected from the study group as well as the duration of DM, type of treatment, degree of blood glucose control (well-controlled defined as H1c < 7%, fasting < 7 mmol/L, postprandial < 9 mmol/L), presence of hypertension (patient with known hypertension or having blood pressure > 140/90 mmHg), its duration, presence of ischemic heart disease (IHD) (assessed by patients history or changes on electrophysiological studies), smoking (whether active or passive), and mortality. The frequency of target lipoprotein levels were studied as well as its level in patients with CHD and CHD risk factors. To study the possible causes of poor lipid control; patients with poor control were interviewed and asked about their diet restriction, about their knowledge of diabetic complications, and the importance of controlling serum lipids; they were also asked about the reasons for poor compliance, if it was due to financial problems or a lack of knowledge. In addition, the patient's medical records were studied and patients taking more than 3 tablets/d were recorded as well as those for whom the treating physicians did not take the proper action, i.e., they were not put on treatment or the dose of their medications was not increased when indicated.

Statistical analysis was performed using the SPSS software. Mean ± SD was determined for quantitative data, and frequency for categorical variables. Chi-square was used to analyze group difference for categorical variables. For continuous variables, *t*-test were used if comparing two groups. A p value < 0.05 was considered significant.

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