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THE LIPID PROFILE OF DIABETIC PATIENTS AT THE DIABETES CLINIC OF THE PHILIPPINE GENERAL HOSPITAL

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ABSTRACT

***Objectives*: To describe the lipid profile of diabetic patients being seen at the Diabetes Clinic of the Philippine General Hospital and to determine any associations between lipid parameters and the BMI, age, or glucose control.**

***Design*: cross-sectional, descriptive**

***Setting*: Adult Diabetes outpatient clinic of a tertiary government hospital.**

***Patients*: 15 type 1 and 255 type 2 diabetic patients seen during the period January 1994 to October 1995.**

***Data gathered*: patient's name, age, sex, weight, height, BMI, fasting blood glucose, total cholesterol, triglycerides, HDL-C, LDL-C.**

***Results*: 1) 40% of type 2 diabetic patients had poor levels of total cholesterol; 8% had poor triglycerides; 38% had poor HDL-C; and 51% had poor LDL-C. For type 1 patients, the results are 27%, 0%, 13%, and 33% respectively. 2) More type 2 diabetic patients have deranged lipid profiles than type 1 patients, notably a higher total cholesterol and lower HDL-C. 3) Thirteen percent of type 1 diabetic patients and 7% of type 2 diabetic patients have desirable levels of all four parameters. One percent of type 2 diabetic patients had poor levels for all four parameters. 4) Total cholesterol and LDL-C are lower for the age group more than 20 to 30 for type 2 diabetics. The LDL-C for the age group more than 30 to 40 which is higher than the other age groups. 5) Fasting blood glucose and glycohemoglobin do not seem to have any significant association with any lipid parameter.**

***Conclusion*: For type 2 diabetic patients, the predominant derangement in lipids are elevated total cholesterol and LDL-cholesterol, and low HDL-cholesterol. This is in contrast to foreign literature which demonstrates elevated triglycerides and low HDL-C. For type 1 diabetic patients, the derangement is the same as that for type 2 but fewer patients are affected. Type 1 diabetic patients have lower triglycerides and LDL than type 2 diabetic patients.**

INTRODUCTION

Heart disease is a major cause of mortality in the Philippines.[1] The National Cholesterol Education Program Adult Treatment Panel II has identified diabetes mellitus, low high density lipoprotein (HDL) and high low density lipoprotein (LDL) as risk factors in the development of coronary artery disease.[2]

Patients with diabetes mellitus have deranged lipid profiles. Being diabetic, they already have one inherent risk factor for CAD. Thus, it becomes important to screen for other risk factors such as the lipid profile. Diabetics with cholesterol levels of greater than 245 mg/dl had twice the cardiovascular mortality compared with those with levels less than 180 mg/dl.[3]

The most common abnormalities found in NIDDM are elevated triglycerides, elevated very low density lipoprotein (VLDL), and low HDL.[3,4,5,6] LDL elevation is occasionally noted, mostly due to an increase in intermediate density lipoprotein (IDL).[7] In IDDM, there is an increase in VLDL, and a decrease in LDL and HDL. These abnormalities improve with the treatment of the IDDM.[3]

The Filipino, with a culture, diet and living standard different from that in developed countries, may have a different lipid profile. Small reports on the lipid profile of Filipino patients have been reported from private and university medical centers. These results are inconsistent. They also do not necessarily agree with those reported in foreign literature.[5,8,9] The Philippine General Hospital, whose patient population belongs mostly to the lower socioeconomic strata of the society, may have a lipid profile different from that described in foreign and local literature.

Note: Study was done while first three authors were Fellows-in-training in Endocrinology at the Philippine General Hospital.

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Objectives:

General

To describe the lipid profile of diabetic patients at the Diabetes Clinic of the Philippine General Hospital.

Specific

1. To stratify the patients according to the levels of total cholesterol, triglycerides, and HDL-C into desirable, borderline, and poor levels.

2. To determine any association between lipid parameters and the body mass index (BMI), age, or glucose control.

MATERIALS AND METHODS

All patients seen at the Diabetes Clinic during the period January 1994 to October 1995 whose lipid profile were determined, excluding those currently on lipid lowering agents and pregnant patients. The following data were collected: patient's name, age, sex, weight, height, BMI, fasting blood glucose, glycohemoglobin (HbA1c), total cholesterol, triglycerides, HDL-C, LDL-C.

The lipid profile and fasting blood glucose were tested by the Du Pont Dimension ES Sample Management System using the enzymatic method. The fasting glucose was determined using hexokinase. The total cholesterol was determined using cholesterol esterase. HDL-C was separated from other lipoprotein fractions using a polyanion reagent and was analyzed using cholesterol esterase. Triglycerides were analyzed using a combination of enzymes, viz., lipase, glycerol dehydrogenase (GDH), and NAD. LDL-C was computed using the formula:

LDL = Total cholesterol - HDL - triglycerides / 2.2

There is a paucity of reference values for Filipinos regarding the parameters that were measured. Therefore, for purposes of this study, the following range of values (as per the American Diabetes Association recommendation) will be used to classify them as desirable, borderline, and poor.[10] See Table I. Although these ranges are intended for type 2 diabetes mellitus (previously known as non-insulin-dependent diabetes mellitus or NIDDM), the same will also be used for those with type 1 diabetes mellitus (previously known as insulin-dependent diabetes mellitus or IDDM) to facilitate comparison.

Table I. American Diabetes Association Recommendations.[10]

		Desirable	Borderline	Poor
Total cholesterol	(mmol/L)	< 5.17	5.17-6.2	> 6.2
Triglyceride	(mmol/L)	< 1.69	1.69-2.82	> 2.82
HDL-C	(mmol/L)	> 1.16	0.9 -1.16	< 0.9
LDL-C	(mmol/L)	< 3.36	3.36-4.14	> 4.14

Procedure used to compare the different groups. The F-test and T-test were used to compare two groups. The Bartett's test and either the analysis of variance (ANOVA) or the Kruskal-Wallis one way analysis of variance were used to compare three or more groups.

RESULTS AND DISCUSSION

A total of 270 patients were included, 15 (6 male and 9 female) of whom were type 1 diabetics and 255 (65 male and 190 female) were type 2 diabetes. Age ranged from 19 to 82 years.

The mean values (and their respective standard deviation) of the various lipid parameters for both types of diabetes are shown in Table II.

Table II. Means and Standard Deviations of Various Lipid Parameters for Both Types of Diabetes. (All Units in mmol/L).

Type of diabetes	Type 1 DM	Type 2 DM
Total cholesterol	5.412+ 1.403	6.087 + 1.327
Triglyceride	1.315 + 0.560	1.665 + 1.216
HDL-C	1.342 + 0.501	1.102 + 0.551
LDL-C	3.471 + 1.352	4.229 + 1.277
FBS	12.726 + 9.684	10.042 + 4.343

The mean triglyceride and HDL-C are desirable for both types of diabetes. There is no significant difference in HDL-C but triglyceride is significantly higher for type 2 diabetic patients. The mean total cholesterol is borderline for both and the difference is not statistically significant. The mean LDL-C is borderline for type 1 and high for type 2 diabetic patients and their difference is statistically significant.

In our series, the number and percentage of patients with desirable, borderline, and poor levels of each of the 3 parameters are shown in Table III.

More type 1 diabetic patients have desirable total cholesterol, triglycerides, HDL-C, and LDL-C than type 2 diabetic patients.

Table III. The Number and Percentage (in parenthesis) of Patients in our Series with Desirable, Borderline, and Poor Levels of Each of the 3 Parameters.

	Desirable	Borderline	Poor
TYPE 1 DM			
Total cholesterol	6 (40%)	5 (33%)	4 (27%)
Triglycerides	11 (73%)	4 (27%)	0 (0%)
HDL-C	9 (60%)	4 (27%)	2 (13%)
LDL-C	7 (47%)	3 (20%)	5 (33%)
TYPE 2 DM			
Total cholesterol	62 (24%)	91 (36%)	102 (40%)
Triglycerides	159 (62%)	76 (30%)	20 (8%)
HDL-C	99 (39%)	60 (24%)	96 (38%)
LDL-C	68 (27%)	57 (22%)	130 (51%)

We compared these findings with other studies on Filipino type 2 diabetic patients. See Table IV for summary.

Table IV. Comparison of the Data from Four Series.

A. Total Cholesterol				
Total cholesterol	Litonjua	Fernando	Magtolis	Ho
Desirable		37.6%		24%
Borderline		36.6%		36%
Poor	5.1%	25.8%		40%
B. Triglycerides				
Triglycerides	Litonjua	Fernando	Magtolis	Ho
Desirable		51.2%		62%
Borderline		35.3%		30%
Poor	26.2%	13.6%	32.8%	8%
C. HDL Cholesterol				
HDL-cholesterol	Litonjua	Fernando	Magtolis	Ho
Desirable				39%
Borderline				24%
Poor	52.8%			38%
D. LDL-Cholesterol				
LDL-cholesterol	Litonjua	Fernando	Magtolis	Ho
Desirable				27%
Borderline				22%
Poor			26.4%	51%

Fernando (1993) showed in his series of Filipino patients that 37.6% had acceptable total cholesterol, 36.6% were borderline, and 25.8% were elevated. Fifty one and two tenths percent (51.2%) had acceptable, 35.3% borderline, and 13.6% elevated triglyceride levels. Of these 295 patients, only 25.1% had both acceptable cholesterol and triglycerides.[8]

In contrast, Hilado and Litonjua (1993), with data from the Makati Medical Center, showed that 26.2% had elevated triglycerides, 5.1% had elevated total cholesterol and 52.8% had decreased HDL-C.[5] This is more congruent with foreign data.

Magtolis and Dalisay (1995) found that 56.8% of type 2 diabetic patients have dyslipidemia, 32.8% having hypertriglyceridemia and 26.4% having elevated cholesterol. Dyslipidemia was more common in females.[9]

We also determined the number and percentage of patients with combined derangement. See Table V.

Table V. The Number and Percentage (in Parenthesis) of Patients in our Series with Combined Derangements.

A1. Total cholesterol and triglycerides for Type 1 DM patients

	Total cholesterol		
Triglycerides	Desirable	Borderline	Poor
Desirable	4 (27%)	4 (27%)	3 (20%)
Borderline	2 (13%)	1 (7%)	1 (7%)
Poor	0 (0%)	0 (0%)	0 (0%)

A2. Total cholesterol and triglycerides for Type 2 DM patients

	Total cholesterol		
Triglycerides	Desirable	Borderline	Poor
Desirable	47 (18%)	59 (23%)	53 (21%)
Borderline	12 (5%)	28 (11%)	36 (14%)
Poor	3 (1%)	4 (2%)	13 (5%)

B1. Total cholesterol and HDL cholesterol for Type 1 DM patients

	Total cholesterol		
HDL-C	Desirable	Borderline	Poor
Desirable	3 (20%)	3 (20%)	3 (20%)
Borderline	2 (13%)	1 (7%)	1 (7%)
Poor	1 (7%)	1 (7%)	0 (0%)

B2. Total cholesterol and HDL cholesterol for Type 2 DM patients

	Total cholesterol		
HDL-C	Desirable	Borderline	Poor
Desirable	23 (9%)	32 (13%)	44 (17%)
Borderline	14 (5%)	17 (7%)	29 (11%)
Poor	25 (10%)	42 (16%)	29 (11%)

C1. LDL cholesterol and triglycerides for Type 1 DM patients

Triglycerides	Desirable	LDL-C Borderline	Poor
Desirable	4 (27%)	3 (20%)	4 (27%)
Borderline	3 (20%)	0 (0%)	1 (7%)
Poor	0 (0%)	0 (0%)	0 (0%)

C2. LDL cholesterol and triglycerides for Type 2 DM patients

Triglycerides	Desirable	LDL-C Borderline	Poor
Desirable	38 (15%)	35 (14)	86 (34%)
Borderline	21 (8%)	16 (6%)	39 (15%)
Poor	9 (4%)	6 (2%)	5 (2%)

D1. LDL cholesterol and HDL cholesterol for Type 1 DM patients

HDL-C	Desirable	LDL-C Borderline	Poor
Desirable	4 (27%)	2 (13%)	3 (20%)
Borderline	2 (13%)	1 (7%)	1 (7%)
Poor	1 (7%)	0 (0%)	1 (7%)

D2. LDL cholesterol and HDL cholesterol for Type 2 DM patients

HDL-C	Desirable	LDL-C Borderline	Poor
Desirable	35 (14%)	27 (11%)	37 (15%)
Borderline	13 (5%)	15 (6%)	32 (13%)
Poor	20 (8%)	15 (6%)	61 (24%)

E1. Triglycerides and HDL cholesterol for Type 1 DM patients

IDDM		Triglycerides	
HDL-C	Desirable	Borderline	Poor
Desirable	7 (47%)	2 (13%)	0 (0%)
Borderline	2 (13%)	2 (13%)	0 (0%)
Poor	2 (13%)	0 (0%)	0 (0%)

E2. Triglycerides and HDL cholesterol for Type 2 DM patients

NIDDM		Triglycerides	
HDL-C	Desirable	Borderline	Poor
Desirable	66 (26%)	23 (9%)	10 (4%)
Borderlin	33 (13%)	25 (10%)	2 (1%)
Poor	(24%) 60	28 (11%)	8 (3%)

Fernando (1993) also reported combined total cholesterol and triglyceride values.[8] See comparison with our data in Table VI.

Two type 1 diabetic patients (13%) and 19 type 2 diabetic patients (7%) had desirable levels of all four parameters (total cholesterol, triglycerides, HDL-C, and LDL-C). Only 3 type 2 diabetic patients (1%) had poor levels of all four parameters.

Table VI. Percentage of Patients with Combined Total Cholesterol and Triglyceride from (a) Fernando (1993)[8] and our Data (b).

	Total cholesterol Desirable		Borderline		Poor	
Triglycerides	a	(b)	a	(b)	a	(b)
Desirable	25.1%	(18%)	15.9%	(23%)	10.2 %	(21%)
Borderline	10.2%	(5%)	16.9%	(11%)	8.17%	(14%)
Poor	2.4%	(1%)	3.7%	(2%)	7.5 %	(5%)

Hypertriglyceridemia has been implicated to increase hepatic VLDL secretion due to increased influx of free fatty acid to the liver, especially in obese patients.[7] Body mass index (BMI), a useful index of obesity, was used to determine possible correlations with the various lipid parameters.

Effect of BMI. For type 2 diabetic patients, all four lipid parameters are not significantly related to the body mass index. For type 1 diabetic patients, there is only one entry for the group with BMI of 24 to less than 28. Excluding this subgroup, no significant difference was found on all four lipid parameters.

Effect of age. All four lipid parameters of type 1 diabetic patients were not significantly affected by age. In type 2 diabetic patients, total cholesterol and LDL were not the same for all subgroups. They vary in the same direction indicating that the change in total cholesterol is due to a change in LDL. The age group of greater than 20 to 30 has a lower value for both parameters while the age group of greater than 30 to 40 has a higher value. When we tested the 4 remaining age groups (from greater than 40 to greater than 70), we found no significant difference for both parameters.

Effect of glucose control (FBS and HbA1c). All patients had FBS determined simultaneously with the lipid profile. Glycohemoglobin (HbA1c) is not a subsidized test and most of our patients could not afford it. It was done in one type 1 diabetic patient and 23 type 2 diabetic patients.

Our analysis confirmed that FBS does not seem to be associated with the lipid profile, probably because it measures instantaneous glucose as contrasted to HbA1c which measures glucose control over the past 2 to 3 months. Glycohemoglobin (HbA1c) also did not seem to show a significant influence. This may be because it really does not affect lipids, or the number of patients who had the examination done is too small.

CONCLUSION

For type 2 diabetic patients in our clinic, the predominant derangement in lipids are elevated total cholesterol and LDL-cholesterol, and low HDL-cholesterol. This is in contrast to foreign literature which demonstrates elevated triglycerides and low HDL-C. For type 1 diabetic patients, the derangement is the same as that for type 2 diabetics but fewer patients are affected. Type 1 diabetic patients have lower triglycerides and LDL than type 2 diabetic patients.

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