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## FREQUENCY OF DYSLIPIDEMIA AMONG TYPE 2 DIABETIC PATIENTS At HOSPITAL UNIVERSITI SAINS MALAYSIA (HUSM)

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### Abstract

Dyslipidaemia accounts as a major risk factor for cardiovascular diseases. The main objective of this study is to evaluate the prevalence of target and non-target levels of lipid profiles among Malaysian type 2 diabetics according to American diabetic association. This is prospective longitudinal the study was conducted with sample of 1077 Type 2 diabetes mellitus outpatient recruited whom attended the diabetes clinics at Hospital Universiti Sains Malaysia (HUSM) in Kelantan. The study period was from January till December 2008. The serum total cholesterol, LDL-cholesterol, HDL-cholesterol and triglycerides were assayed in diabetic outpatients. Selection criteria include any sex aged more than 18 years. Fasting blood samples were analyzed for total cholesterol (TC), triglycerides (TG), low density lipoprotein cholesterol (LDLC), high density lipoprotein cholesterol (HDL-C), glucose and glycosylated hemoglobin (HbA1c). The study assessed the percentage of lipid profile of diabetic patients falling into desirable, borderline and high risk categories according to the criteria laid down by Adult American Diabetic Association. It was found that 36.8, 42.0, 54.3 and 32.0 percent of diabetic subjects had borderline to high risk levels of TC, TG, LDL-C and HDL-C respectively.

It is concluded that type 2 diabetic patients have a high frequency of dyslipidaemia especially for LDL-C and TG. It is suggested that along with glycaemic control health care providers should focus more on proper management and control of lipid profiles.

**Key Words:** Type 2 Diabetes Mellitus, Dyslipidaemia, Triglycerides, Glycaemic control, LDL-C, Triglycerides, HUSM.

## Introduction

Dyslipidaemia accounts as a major risk factor for cardiovascular diseases. Dyslipidaemia are abnormal concentrations of lipids in the blood, dyslipidaemia is common in Type 2 DM patients; it is present at the time of diagnosis, and even in the pre-diabetic phase. The prevalence of dyslipidaemia is increased by at least two fold in presence with Type 2 DM and involves all class of lipoprotein (P.Jean et al., 2001). Dyslipidaemia is a major risk factor for macrovascular disease. There is strong evidence, coming from landmark secondary prevention trials described as well as from meta-analyses (Costa et al., 2006), that LDL lowering is associated with significant reduction in cardiovascular risk in patients with diabetes. Some studies have suggested that increased triglyceride levels might induce insulin resistance (Steiner et al., 1982; Bieger et al., 1984). The optimal treatment strategy for such patients remains controversial.

The main objective of the present study to determine the frequency of desirable and high risk levels of lipid profile in a cohort of Malaysian type 2 diabetic patients according to American Diabetic Association (ADA, 2008).

## Materials and Methods

Total of 1077 diabetic Patients attending diabetic clinic were included in this study. These numbers represent all the total numbers of patient attending teaching hospital of USM (HUSM)

outpatient clinic (The study was conducted patients selection inclusion criteria are type 2 diabetes mellitus outpatients who attended and were on regular follow –up at diabetes clinics of HUSM within study periods& age above 18years and the exclusion criteria for this study included patients who were Juvenile Diabetes, Gestational diabetes, advanced chronic kidney disease and diabetes due to other causes were excluded).The study was a Prospective follow-up descriptive study. Study conducted in the Kelantan state of Malaysia, from January to December 2008 at the study was done at Hospital Universiti Sains Malaysia (tertiary center) at outpatients diabetic clinic. Standardised Data collection was developed and used together data record.

Data included demographical characteristics, duration of having diabetes mellitus, glycaemic control, fasting plasma glucose, postprandial plasma glucose, blood pressure measurement, Lipid profile measurement.

Statistical Package for the Social Sciences (SPSS) software version 11.0 (Chicago, IL, USA) was used for data analysis. The Data obtained were analysed using descriptive characteristics and lipid profile of the study patients were calculated as Mean  $\pm$  SD (Standard Deviation) for continuous variables and as percentages for categorical variables.

## Results

A total of 1077 type 2 diabetic

patients were involved in this study. Descriptive statistics were used to describe the sociodemographic characteristics of patients as shown in Table 1.

A total of 476 (44.2%) of patients in this study were males and 601 (55.8%) were females. According to racial distribution, 916 (85.1%) were Malay, 150 (13.9%) were Chinese and 11 (1.0%) were Indians. This proportion of ethnic group is generally representative of the Kelantan population. The age of patients recruited in this study range was from 18 to 88 years and was categorised into four

groups. Majority 626 (58.1%) of patients in this study were in age group more than 50-65 years. This was followed by the age group of > 65 years and 35-50 years which consisted of 242 (22.5%) and 194 (18%), respectively. Furthermore, the least affected group was  $\leq 35$  years 15 (1.4%).

Concerning the level of education, the literacy level of the patients was moderate. More than half of the patients 580 (53.9%) in this study had a lower level of education, whereas 497 (46.1%) patients had a higher level of education.

Table 1 Socio-demographic characteristics of type 2 diabetic patients

Variable	n (%)
<b>Gender</b>	
Male	476 (44.2)
Female	601(55.8)
<b>Age (years)</b>	
$\leq 35$ yaers	15 (1.4)
35-50 years	194 (18)
50-65years	626 (58.1)
>65 years	242 (22.5)
<b>Race</b>	
Malay	916 (85.1)
Chinese	150 (13.9)
Indians	11 (1.0)
<b>Smoking History</b>	
Current smoker	66 (6.1)
Previous smoker	81 (7.5)
Never smoked	930 (86.4)
<b>Alcohol History</b>	
Current drinker	10 (0.9)
Previous drinker	6 (0.6)
Never drink	1061 (98.5)

**Physical activity**

Active $\geq$ 150 min/wk	471 (43.7)
Non active < 150 min/wk	606 (56.3)

**Level of education**

Lower level of education	580 (53.9)
Higher level of education	497 (46.1)

**Family history of diabetes**

Yes	141 (13.1)
No	936 (86.9)

The mean duration of diabetes was  $11 \pm 6.81$  years, ranging from less than one year to forty years and 74.6% had diabetes for more than 5 years. According to the American diabetic association (2008) guideline of glycaemic control for diabetic patients the mean of HbA1c were  $8.7\% \pm 2.3$ ,

while mean of fasting plasma glucose levels were  $7.8 \pm 3.7$  mmol/l, and mean of postprandial plasma glucose level were  $10.0 \pm 4.3$  mmol/l. Descriptive statistics were used to describe the health and clinical characteristics of patients as shown in Table 2.

Table 2 Health and Clinical Characteristics of Type 2 diabetic patients

Variable	Mean ( $\pm$ SD)
Age (years)	58.37(9.8%)
BMI (kg/m <sup>2</sup> ) Asia pacific	26.98(4.77%)
Diabetes duration (years)	11.0(6.81%)
HbA1c (%)	8.72 ( $\pm$ 2.34)
Fasting plasma glucose (mmol/l)	7.89 ( $\pm$ 3.72)
Post prandial plasma glucose (mmol/l)	10.03 ( $\pm$ 4.38)
Systolic blood pressure (mmHg)	135.98 ( $\pm$ 19.78)
Diastolic blood pressure (mmHg)	80.62 ( $\pm$ 9.83)
Creatinine Clearance ( ml/min)	55.81 ( $\pm$ 22.31)

In current study the mean of lipid profile were  $2.82 \pm 1.08$  mmol/l (108 mg/dl) for LDL-C, the mean for total cholesterol were  $4.98 \pm 1.17$  mmol/l (192 mg/dl), while mean for HDL-C were  $1.40 \pm 0.54$  mmol/L (51 mg/dl) and

mean for TG were  $1.74 \pm 0.85$  mmol/l (154 mg/dl). While according to ADA, most of the patients had satisfactory control as regard to total cholesterol and according to American Diabetes Association Guidelines, 681 (63.2%) of

patients had optimal cholesterol < 5.2 mmol/l (<200 mg/dl) level, while 396 (36.8%) had cholesterol  $\geq$  5.2 mmol/L ( $\geq$ 200 mg/dl) level. As for lipid control, with regards to LDL-C 493 (45.8%) had optimal LDL-C < 2.6 mmol/l (<100 mg/dl), while 285 (26.5%) had LDL-C 2.6-3.3 mmol/l (100-130 mg/dl), 186 (17.3%) had LDL-C 3.4-4.1 mmol/L (130-200 mg/dl), and only 113 (10.5%) had LDL-C >4.1 mmol/l (>200 mg/dl), but most of present study population had unsatisfactory control with regard to HDL-C according to American Diabetes Association Guidelines. A total of 384 (35.7%) of male patients had optimal HDL-C >1.0 mmol/l (40 mg/dl), while 348 (32.3%) of females had HDL-C >

1.3 mmol/l (50 mg/dl), 253 (23.5%) of females had HDL-C  $\leq$  1.3 mmol/l ( $\leq$  50 mg/dl) and only 92 (8.5%) of male had non target HDL-C  $\leq$ 1.0 mmol/l ( $\leq$  40 mg/dl) control by reviewing TG profile most of the patients had satisfactory control, with regards to TG, 625 (58.0%) of patients had optimal TG < 1.7 mmol/l (< 150 mg/dl), while 229 (21.3%) had high TG 2.4-5.7 mmol/L (200-500 mg/dl) and 223 (20.7%) had borderline high TG control, 1.7-2.3 mmol/L (150-200 mg/dl).

Table 3 Percentage distribution of desirable, moderate risk and high risk levels in DM patients according American Diabetic Association (N = 1077)

Table 3 Characteristics of lipid profile among type 2 DM patients

Variables	n (%)	Mean ( $\pm$ SD)
<b>LDL cholesterol (mmol/l) ADA</b>		
Normal < 2.6 mmol/l (<100 mg/dl)	493 (45.7)	
Border high 2.6 - 3.3 mmol/l (100 - 130 mg/dl)	285 (26.5)	
High 3.4 - 4.1 mmol/l (131-200 mg/dl)	186 (17.3)	2.82 ( $\pm$ 1.08)
Very high > 4.1 mmol/l (>200 mg/dl)	113 (10.5)	
<b>Total cholesterol (mmol/l) ADA</b>		
Target < 5.2 mmol/l (< 200 mg/dl)	681 (63.2)	4.98 ( $\pm$ 1.17)
Non target $\geq$ 5.2 mmol/l ( $\geq$ 200 mg/dl)	396 (36.8)	
<b>Triglycerides (mmol/l) ADA</b>		
Normal < 1.7 mmol/l (< 150 mg/dl)	625 (58)	
Border high 1.7-2.3 mmol/l (150-200 mg/dl)	223 (20.7)	1.74 ( $\pm$ 0.85)
High 2.4-5.7 mmol/l (200-500 mg/dl)	229 (21.3)	

**HDL cholesterol (mmol/l) ADA**

Target (male)	>1.0 mmol/l (40 mg/dl)	384 (35.7)	
Non-target (male)	≤1.0 mmol/l (≤ 40 mg/dl)	92 (8.5)	1.40 (± 0.54)
Target (Female)	>1.3 mmol/l (>50 mg/dl)	348 (32.3)	
Non-target (Female)	≤1.3 mmol/l (≤50 mg/dl)	253 (23.5)	

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**Discussion**

The major risk factors in DM are glycaemic status, dyslipidemia and hypertension. The present study was an effort to provide an insight into some of the risk factors in DM. the percentage is quite higher for triglyceride and LDL-C. According to American diabetic association LDL-C is the main target of cardiovascular prevention.

Diabetic dyslipidaemia plays an important role in the increased cardiovascular mortality and morbidity seen in patients with diabetes. In previous studies (McGarry et al., 1992; Boden et al., 1997) it was reported that recognition of the key role of lipids as mediators of insulin resistance in individuals with obesity, dyslipidaemia and Type 2 DM. The characteristic dyslipidaemia in Type 2 DM includes a slight increase in triglycerides, low levels of HDL-C and normal to slightly elevated levels of total cholesterol (TC) and LDL-cholesterol (LDL-C). The main problem, however, is that the molecules of low density lipoproteins (LDL) are “small and dense” and consequently more atherogenic. But focusing only on the measurement of LDL-C concentration can underestimate the risk related to the concentration of

the atherogenic lipoprotein molecules in Type 2 DM. In a study on Indian type 2 diabetic patients, high prevalence of dyslipidaemia has been reported (Udawat et al., 2001). A similar the current study a higher prevalence of undesirable levels of LDL-C has been reported in study on Pakistani diabetic patients (Habib et al., 2003).

The explanation for unsatisfactory lipid control in this study may be due to various reasons like advancing age, obesity and genetic factors, disease unawareness, socioeconomic status, sedentary life style, intake of unhealthy food and poor compliance to treatments. As in this study, similar results shown by Akbar et al. (2003) suggested that poor control was associated with poor diet compliance and use of multiple medications.

**Conclusion**

In terms of benefit for cardiovascular protection, treatment of hyperlipidemia has been reported to be more beneficial than blood pressure or glycaemic control (UKPDS, 1998). It is concluded that type 2 diabetic patients have a high frequency of atherogenic dyslipidaemia especially for triglyceride and LDL-C. It is suggested that along with glycaemic control health care

providers should focus more on proper management and control of lipid profiles.

### Limitation

The present study was based on type 2 DM clinic at HUSM (tertiary center); thus data from other centers are required to determine whether the finding in this study can be generalized to diabetes care setting in general. Furthermore the population of this study was that of diabetic outpatients.

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