Lipid Disorders in Thai Diabetics

S.C. BUNNAG, C. VAJANAMARHUTUE, S. PASATRAT and S.
CHANDRAPRASERT

*Division of Endocrinology and Metabolism and Division of
Hormone Research, Anandamahidol Foundation,
Department of Medicine, Faculty of Medicine,
Chulalongkorn University, Bangkok 10500, Thailand*

BUNNAG, S.C., VAJANAMARHUTUE, C., PASATRAT, S. and CHANDRAPRASERT, S.
Lipid Disorders in Thai Diabetics. Tohoku J. exp. Med., 1983, **141**, Suppl., 605-
609 — The incidence of fasting HLP in 326 diabetics was 68.4 percent. The
common types of HLP were type IV, IIb, IIa and III respectively. There was one
case of type V. HDLC was decreased in all three groups of diabetics together with
elevated ratio of TC to HDLC comparing with the controls of similar age and sex
VLDL and TG were significantly elevated in NIDDM aged 60 and over comparing
with IDDM but not significantly different from NIDDM aged below 60. The early
detection and treatment of HLP along with optimum control of blood glucose are
of utmost importance to prevent further complications caused by atherosclerosis.
——— hyperlipidemia, atherosclerosis

Cardiovascular death was the most common outcome in 157 hospital dead diabetics analysed (29.3 percent) at Chulalongkorn University Hospital despite modern therapy. Epidemiological observations in different countries have clearly established that ischemic heart disease is strongly associated with hyperlipidemia (ILP)¹⁻³. HLP was more pronounced in the diabetic group with coronary heart disease than ; nondiabetics with the same problem⁴. In most surveys, the incidence of fasting HLP in diabetics was 30 to 40 percent^{4,5}.

Lately many investigations have dealt with the plasma concentration of high density lipoprotein cholesterol (HDLC) and other lipoprotein fractions in diabetics and correlated them with the regimes of treatment^{6,7}. The interpretation of the results, however, has been difficult because of the heterogeneity of diabetes itself together with the difference of age, sex, diet, diabetic control, regimes of treatment and many other environmental factors. HDLC was used as a measure of HDL concentration in spite of the fact that HDL₂ protects against atherosclerosis and this fraction is lowered in patients with atherosclerosis⁸.

The aim of this study was of 3 folds.

1. To investigate the incidence of HLP in insulin dependent diabetes

S.C. Bunnag, M.D., Ph. D., Professor of Medicine Chulalongkorn University Hospital,
Roma 4 Road, Bangkok 10500, Thailand.

mellitus (IDDM), non-insulin dependent diabetes mellitus (NIDDM) aged below 60 and NIDDM aged 60 and over.

2. To compare the lipoprotein fractions of each group of diabetics with the normal controls of matched age and sex.

3. To compare the lipoprotein fractions among these three groups of diabetic

TABLE 1. *Lipoprotein typing in 326 diabetic patients*

Typing	Group I (<i>n</i> =9)		Group II (<i>n</i> =214)		Group III (<i>n</i> =103)		Percent
	<i>n</i>	Percent	<i>n</i>	Percent	<i>n</i>	Percent	
N	4	44.5	68	31.8	31	30.1	31.6
IIa	3	33.2	31	14.5	19	18.4	16.3
IIb	2	22.2	43	20.1	19	18.4	19.6
III	—	—	16	7.5	8	7.8	7.4
IV	—	—	56	26.1	25	24.3	24.8
V	—	—	—	—	1	1.0	0.3

TABLE 2. *Comparison of fasting serum glucose and lipid controls of matched age and sex*

	<i>n</i>	FBS (mg/100 ml)
Group I		
Female IDDM	8	143±55.6
Female control	30	89± 6.8
<i>p</i> -value		<0.001
Male IDDM	1	131.00
Male control	19	95± 5.1
Group II		
Female NIDDM	160	164±44.5
Female control	21	95± 7.1
<i>p</i> -value		<0.001
Male NIDDM	54	160±49.5
Male control	12	95± 7.9
<i>p</i> -value		<0.001
Group III		
Female NIDDM	81	165±44.8
Female control	16	101±10.8
<i>p</i> -value		<0.001
Male NIDDM	22	153±50.2
Male control	14	98±10.4
<i>p</i> -value		<0.001

patients.

MATERIAL AND METHOD

Subjects

Three hundred and twenty-six diabetics, 77 men and 249 women who visited the Out-Patient Diabetic Clinic, Chulalongkorn University Hospital were picked at random. These patients were divided into 3 groups: I) IDDM aged 16 to 29; II) NIDDM aged 30 to 59; and III) NIDDM aged 60 to 82. One hundred and twelve healthy persons, 45 males and 67 females, were served as controls. They were also divided into 3 groups to match with the diabetics of similar age and sex.

Methods

Serum glucose (FBS), cholesterol (TC), triglycerides (TG) and HDLC were determined in all subjects after a 12 to 14 hr fasting period (9-12). LDL was estimated by the method of Friedewald and VLDL by calculation (13).

RESULT

HLP was found in 68.4 percent of 326 diabetics studied. The common types of HLP were types IV, IIb, IIa and III respectively. There was only one case of

fractions of each group of diabetics with the normal

TC (mg/100 ml)	TG (mg/100 ml)	HDLC (mg/100 ml)	TC : HDLC
251±66.6	140± 34.2	44.3±18.1	6.28±2.94
199±38.9	114± 35.4	54.4±11.4	3.76±0.80
<0.01	NS	<0.05	<0.001
312.00	226.00	37.2	8.38
229±34.8	100± 39.4	45.1± 6.2	5.51±0.87
261±68.1	210±102.9	42.2± 9.1	6.47±2.13
227±38.2	128± 44.2	59.5±10.7	4.17±0.91
<0.05	<0.001	<0.001	<0.001
260±66.6	209±106.6	38.7± 9.51	6.57±2.17
215±48.7	141± 54.9	46.1± 8.6	4.69±0.90
<0.05	NS	<0.025	<0.005
268±66.7	233±156.8	42.5±10.7	6.68±2.2
248±29.3	146± 64.2	53.1±13.2	4.56±1.19
NS	<0.05	<0.001	<0.001
268±95.3	195± 82.3	39.0±71.0	7.08±2.82
235±39.1	137± 33.6	44.9± 8.3	5.33±1.03
NS	<0.025	<0.05	<0.05

TABLE 3. *Test of significance in 3 groups of 326 diabetics studied*

	Group I/II	Group II/III	Group I/III
FBS	NS	NS	NS
TC	NS	NS	NS
HDL C	NS	NS	NS
LDL	NS	NS	NS
VLDL	NS	NS	<0.001*
TG	NS	NS	<0.001*
TC : HDLC	NS	NS	NS

* Degree of significance (*p*-value).

NS: Not significant.

type V (Table 1). HDLC was decreased in all 3 diabetic groups compared with the controls of similar age and sex. The atherosclerotic index (TC/HDLC) was also significantly elevated in all groups of diabetics as demonstrated in Table 2. Comparison of all parameters (FBS, TC, TG, HDLC, TC/HDLC, LDL, VLDL) among these three diabetic groups was also attempted. VLDL and TG were significantly elevated in group III comparing with group I ($p < 0.001$) as shown in Table 3.

It is noteworthy to mention that FBS was significantly elevated in all 3 diabetic groups ($p < 0.001$), and yet normal lipoprotein pattern was found in 103 patients (31.6 percent).

DISCUSSION

Fasting blood glucose, LDL and VLDL are usually increased with age in normal individuals. However, FBS should not be over 120 mg/100 ml in any age group. The incidence of fasting HLP in our diabetics was rather high compared with other series^{4,5}, most likely due to the status of diabetic control and high carbohydrate intake in Thai dishes¹⁴. However, fasting HLP persisted in some of our patients even satisfactory control of blood glucose was achieved. Diabetic HLP, although mostly secondary forms, should be viewed as the result of interaction between diabetic syndrome, the genetic background of the patient and the environmental influence¹⁵.

Decreased HDLC and elevated ratio of TC to HDLC were in favor of developing atherosclerosis in view of the assumption that HDL₂ which protected against atherogenesis was also decreased⁸. Achievement of optimum blood glucose along with restriction of carbohydrate intake, simple carbohydrate in particular, restriction of saturated fat, weight reduction in obese diabetics, and exercise are of primary concern. However, the early detection and treatment of HLP along with optimum control of blood glucose are of utmost importance to prevent further complications caused by macroangiopathy.

References

- 1) Kannel, W.B., Castelli, W.P., Gordon, T. & McNamara, P.M. (1971) Serum cholesterol, lipoproteins and the risk of coronary heart disease. The Frammingham study. *Ann. intern. Med.*, **74**, 1-12.
 - 2) Carlson, L.A. & Bottiger, L.E. (1972) Ischaemic heart disease in relation to fasting values of plasma triglycerides and cholesterol (Stockholm prospective study). *Lancet*, (April 22), 865-868.
 - 3) Albrink, M.J., Meigs, J.W. & Man, E.B. (1961) Serum lipids, hypertension and coronary artery disease. *Amer. J. Med.*, **31**, 4-23.
 - 4) Bunnag, S.C., Vajanamarhutue, C., Chienpradit, K. & Israsena, T. (1978) Lipid profile in diabetic and nondiabetic subjects with and without myocardial infarction. *J. med. Ass. Thailand*, **61**, 503-513.
 - 5) New, M.I., Roberts, T.N., Bierman, E.L. & Reader, G.G. (1963) The significance of blood lipid alterations in diabetes mellitus. *Diabetes*, **12**, 208-212.
 - 6) Lopes-Virella, M.F.L., Stone, P.G. & Colwell, J.A. (1977) Serum high density lipoprotein in diabetic patients. *Diabetologia*, **13**, 285-291.
 - 7) Lisch, H.-J. & Sailer, S. (1981) Lipoprotein pattern in diet, sulphonylurea, and insulin treated diabetics. *Diabetologia*, **20**, 118-122.
 - 8) Gofman, J.W., Young, W. & Tandy, R. (1966) Ischemic heart disease. atherosclerosis, and longevity. *Circulation*, **34**, 679-697.
 - 9) Sethratanapongsa, T., Vajanamarhutue, C., Yawapongsiri, V., Chaichanwatanakul, V. & Bunnag, S.C. (1972) Determination of serum glucose with modified single glucose oxidase-peroxidase. *Chulalongkorn med. J.*, **22**, 185-191.
 - 10) Abell, L.L., Levy, B.B., Brodie, B.B. & Kendall, F.E. (1952) A simplified method for the estimation of total cholesterol in serum and demonstration of its specificity. *J. biol. Chem.*, **195**, 357-366.
 - 11) Fletcher, M.J. (1968) A colorimetric method for estimating serum triglycerides. *Clin. chim. Acta*, 393-397.
 - 12) Warnick, R. & Albers, J.J. (1978) Heparin-Mn⁺⁺ quantitation of high-density-lipoprotein cholesterol: An ultracentrifugation procedure for lipemic samples. *Clin. Chem.*, **24**, 900-904.
 - 13) Friedwald, W.T., Levy, R.I. & Fredrickson, D.S. (1972) Estimation of the concentration of low density lipoprotein cholesterol in plasma without use of the preparative ultracentrifuge. *Clin. Chem.*, **18**, 499-502.
 - 14) Israsena, T., Thaweratana, P., Plengvidhya, C.S. & Bunnag, S.C. (1974) Lipid profile in normal Thai subjects. *J. med. Ass. Thailand*, **57**, 14-21.
 - 15) Goldberg, R.B. (1981) Lipid disorders in diabetes. *Diabetes Care*, **4**, 561-572.
-