RELATIONSHIPS OF SERUM CHOLESTEROLS (TOTAL AND ESTERIFIED) WITH SERUM URIC ACID

N Saha

SYNOPSIS

353 healthy Indian subjects of both sexes of age group 18—60 years were investigated to examine the possible relationship of serum uric acid and serum total and esterified cholesterol levels. A hgihly significance positive correlation of serum uric acid with serum cholesterols, particularly with the ester form has been found.

INTRODUCTION

It is generally believed that atherosclerotic process is frequently associated with hypercholesterolaemia and hyperuricaemia, and it has been postulated that serum cholesterol and uric acid may be associated with the development of atherosclerosis. But the exact mechanism is not known at the moment. Since both lipid and uric acid levels of blood are increased in coronary arterial diseases, one would naturally expect some relationship between these two blood indices and the predisposition and development of the disease. In the past some work has been done to examine the question of probable association between serum total cholesterol, triglyceride and uric acid levels of blood in patient (1-6), but the results are far from conclusive.

Department of Physiology
Faculty of Medicine
National University of Singapore
Singapore 0511

N Saha, BSc, MBBS, MD, PhD (Med)
Associate Professor

It is known that in atheroma, there is a significant increase of cholesterol ester, compared to other lipid fractions, in the atheromatous plaque of the arterial wall [7]. It is therefore likely that esterified cholesterol level of blood may have some influence in the development of artherosclerotic process, and as such more closely associated with serum uric acid level. But unfortunately, there is no recorded evidence in this direction. In our previous studies we noted more pronounced increase of serum esterified cholesterol level compared to increase in free cholesterol, with increase of age, body weight and body fat [8,9].

We, therefore, thought it worthwhile to examine the question of possible association of serum total and esterified cholesterol levels with serum uric acid in healthy individuals.

MATERIALS AND METHODS

353 healthy Indian subjects of both sexes of age group, 18 to 60 years, were investigated for serum uric acid and serum total cholesterol levels. Out of these, 259 subjects were investigated for serum esterified cholesterol level also. 10 ml of fasting venous blood was collected and serum was separated. Total cholesterol was estimated by the method of Bloor et al (1922) (10) observing all the advocated precautions. Serum esterified cholesterol was estimated by digitonin precipitation of free cholesterol and estimation by the above method. Serum uric acid was estimated by the method of Folin (1933) (11).

RESULTS AND DISCUSSION

From Table I it is seen that there is a positive correlation between serum uric and serum total cholesterol levels, with parallel increase of both in frequency distribution ($X_1^2 = 6.33$, $P = 0.012$). From Table II it is further noted that the mean serum uric acid levels progressively increase with increase of serum total cholesterol levels. The mean serum uric acid level in the lower range of serum total cholesterol level (100-174 mg%) is 3.50 ± 0.69 and that in the higher range (175-267 mg%) is 3.69 ± 0.75 mg% and the difference is not statistically significant ($P = > 0.05$). This is in agreement with the observation of Blahos and Reisenauer, Kusell et al, and Schoenfeld et al but opposed to that of Berkwits, and Dunn et al, who failed to get any such correlation.

From Table III it is seen that there is a better positive correlation of serum uric acid with serum esterified cholesterol level than that of serum total cholesterol. The difference in frequency distribution is more striking giving an X_1^2 value of 12.00 ($P = < 0.005$). From Table IV it is further observed that the mean serum uric acid levels in the lower (64—124 mg%) and higher (125—230 mg%) ranges of serum esterified cholesterol are respectively 3.36 ± 0.61 and 3.74 ± 0.75 mg% and the difference is highly significanct ($P = < 0.01$). It is further noted that the levels of serum uric acid progressively increase with the increase of serum esterified cholesterol level. This is compatible with our previous observation of relationship of serum chlesterols with age, body weight and body fat. This further corroborates the accepted fact that there is several fold increase of esterified cholesterol in the arterial wall in atherosclerosis.

It therefore appears that there is a positive correlation of serum uric acid with serum cholesterols (total and esterified) in healthy individuals, but the significance of the above relationship is not known at the present moment. It may be that one is the effect of the other or may be that there is a common denominator influencing the metabolic pathways of both.

TABLE I: FREQUENCY DISTRIBUTION OF SERUM URIC ACID LEVELS AT DIFFERENT LEVELS OF SERUM TOTAL CHOLESTEROL

Serum total cholesterol (mg/100 ml)	SERUM URIC ACID LEVELS (mg/100 ml)								
	1.5—1.9	2.0—2.4	2.5—2.9	3.0—3.4	3.5—3.9	4.0—4.4	4.5—4.9	5.0—5.4	5.5—6.4
100—124	1	—	10	7	8	4	2	—	—
125—149	1	—	24	20	14	10	3	2	1
150—174	—	1	10	31	20	12	5	2	—
175—199	—	3	12	15	12	15	3	3	2
200—224	—	3	2	8	15	14	5	—	—
225—249	—	2	5	10	7	6	3	1	1
Above 250	—	—	5	5	2	3	3	—	—
All groups	2	9	68	96	78	64	24	8	4
100—174	2 (1.1)[x]	1 (0.5)	44 (23.4)	58 (30.1)	42 (22.3)	26 (13.8)	10 (5.3)	4 (2.1)	1 (0.5)
Above 175	0	8 (4.8)	24 (14.5)	38 (23.0)	36 (21.8)	38 (23.0)	14 (8.5)	4 (2.4)	3 (1.8)

[x]Figures in parenthesis denote percentage of subjects.

$X_1^2 = 6.33$ $P = 0.012$

Total Cholesterol	Serum Uric Acid	
	1.5—3.4	3.5—6.4
100—174	105 (56%)	83 (44%)
175—260	70 (42%)	95 (58%)

TABLE II: SERUM URIC ACID LEVELS AT DIFFERENT LEVELS OF SERUM TOTAL CHOLESTEROLS

	Serum total cholesterol (mg/100 ml)	No. of subjects	SERUM URIC ACID (mg/100 ml) Range	Mean ± SD
I	100—124	32	1.6—4.9	3.39 ± 0.69
II	125—149	74	1.5—7.9	3.45 ± 0.75
III	150—174	81	2.0—5.4	3.59 ± 0.57
IV	175—199	65	2.0—5.8	3.68 ± 0.81
V	200-224	47	2.0 – 4.9	3.72 ± 0.64
VI	225—249	34	2.1—5.9	3.65 ± 0.88
VII	Above 250	19	2.5—5.4	3.68 ± 0.80
VIII	100—174	188	1.5—7.9	3.50 ± 0.69
IX	Above 175	165	2.0—5.9	3.69 ± 0.75

P: I to V => 0.05
VIII to IX = > 0.05

TABLE III: FREQUENCY DISTRIBUTION OF SERUM URIC ACID LEVELS AT DIFFERENT LEVELS OF SERUM ESTERIFIED CHOLESTEROL

Serum esterified cholesterol (mg/100 ml)	SERUM URIC ACID LEVELS (mg/100 ml) 1.5—1.9	2.0—2.4	2.5—2.9	3.0—3.4	3.5—3.9	4.0—4.4	4.5—4.9	5.0—5.4	5.5—6.4
64—74	—	—	4	2	2	2	1	—	—
75—99	—	1	10	17	7	5	2	1	—
100—124	1	1	25	31	18	8	3	1	—
125—149	—	1	9	8	11	12	3	2	—
150—174	—	1	3	10	5	7	1	—	—
175—199	—	1	3	1	6	2	3	—	1
200—230	—	—	—	1	1	1	2	1	—
64—124	1 (0.7)[x]	2 (1.4)	39 (27.5)	50 (35.2)	27 (19.0)	15 (10.6)	6 (4.2)	2 (1.4)	0
125—230	0	3 (3.1)	15 (15.5)	20 (20.6)	23 (23.7)	22 (22.7)	9 (9.3)	3 (3.1)	2 (2.1)

[x]Figures in parenthesis denote percentage of subjects.

$X_1^2 = 15.2$ P =<0.005

Cholesterols Esters	Serum Uric Acid 1.5—3.4	3.5—6.4
64-124	92 (65%)	50 (35%)
125-230	38 (39%)	59 (61%)

TABLE V: SERUM URIC ACID LEVELS AT DIFFERENT LEVELS OF ESTERIFIED CHOLESTEROLS

	Serum esterified cholesterol (mg/100 ml)	No. of subjects	SERUM URIC ACID (mg/100 ml) Range	Mean ± SD
I	60—74	11	2.5—4.0	3.48 ± 0.70
II	75—99	43	2.9—5.4	3.42 ± 0.64
III	100—124	88	1.5—5.4	3.35 ± 0.60
IV	125—149	47	2.1—6.3	3.75 ± 0.75
V	150-174	27	2.0—4.9	3.55 ± 0.60
VI	175—199	17	2.0—4.8	3.81 ± 0.85
VII	200—230	6	3.0—5.4	4.33 ± 0.65
VIII	64—124	142	1.5—5.4	3.36 ± 0.61
IX	125—230	97	2.0—6.3	3.74 ± 0.75

P: VIII to IX = < 0.01

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