COMPARATIVE ACCOUNT OF SERUM LIPIDS, LIPOPROTEINS AND APOLIPOPROTEIN-B IN PATIENTS OF CORONARY ARTERY DISEASE

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ABSTRACT

Serum total lipids (cholesterol and triglyceride), lipoproteins (VLDL, LDL and HDL) and Apolipoprotein-B levels of normal healthy individuals (n=25) and coronary artery disease patients (n=25) were estimated. The objective of the present study was to ascertain the role of apo-B in causation and inheritance of coronary artery disease. It was observed that on an average serum total cholesterol and triglyceride more than 200 mg/dl bring the individuals to a risk of coronary artery disease (CAD) irrespective of the age. CAD patients achieved this value at an early age (35-45 years). Similarly VLDL and LDL levels were found to be significantly raised in CAD patients when compared to that of age matched normal individuals, with patients achieving risk values at an early age. HDL levels were found to be significantly lower in CAD patients as compared to normal individuals. Serum apo-B levels were significantly raised in CAD patients as compared to age matched normal individuals. Patients with positive family history of CAD had raised serum apo-B levels than those having negative family history. A positive coefficient of correlation was observed between serum apo-B and LDL levels suggesting that more the number of Apo-B particles, more will be the synthesis of atherogenic particle (LDL). Patients with negative family history had serum apo-B levels closer to those of normal individuals and in these individuals HDL levels were found to be significantly lowered, suggesting that loss of scavenger role of HDL could be the risk factor responsible for the causation of CAD in these patients, with negative family history of coronary artery disease.

KEY WORDS

Apo-B, age variations, CAD risk, inheritance, lipids, lipoproteins.

INTRODUCTION

Serum lipid (cholesterol, triglycerides) and lipoprotein levels (VLDL, LDL and HDL) do have immense importance in CAD patients because variations from normal levels can predict the cause of CAD to a great extent, but now a days Apolipoproteins have been considered as more stable risk factor than lipid parameters (1,2). It is believed that apo-B estimation in normolipidemic patients might be an important parameter in predicting the cause of CAD.

MATERIALS AND METHODS

Twenty five patients suffering from CAD were assessed for serum total cholesterol, triglycerides VLDL, LDL, HDL and Apo-B levels. 25 normal healthy volunteers were taken as age matched controls. All the patients were pure cases of IHD, free from the added risk factors like diabetes mellitus, hypertension, thyroid, kidney

disease, alcoholism and smoking. Family history was also taken of all individuals. All the normal individuals had negative family history of CAD (n=25) whereas in case of patients 13 were having positive family history and 12 were having negative family history of CAD. There is no effect of fasting or non fasting conditions on Apo-B levels but since total lipid profile was to be done, subjects were kept on 12 hr overnight fast. Blood samples were withdrawn from antecubital vein, allowed to clot for 25-30 mins for proper serum extraction after centrifuging for 5 mins.

Total cholesterol was estimated by Zlatkis method, modified by Zak (3), serum triglyceride by enzymatic GPO-PAP method (4), HDL-C by method of Burstein *et al* (5), LDL-C by method of Bates *et al* (6) and VLDL-C by method of Lowenstein *et al* (7).

Serum Apo-B levels were estimated by Immunoturbidimetric method (Diasys diagnostic systems GmbH and Co. KG site Strasse 9 65558 Holzheim Germany) (8). This method involved the end point determination of the concentration of Apo-B by antigen-antibody reaction between antibodies to Apo-B and Apo-B present in the sample. Reagents used were TRIS buffer (pH 7.5), poly ethylene glycerol

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detergent stabilizers and antihuman Apo-B (Goat antibody).

Statistical Analysis

Mean, standard deviation and Standard Error were calculated. Students't' was applied; 'p' values were calculated to assess significance of the results.

RESULTS AND DISCUSSION

Serum samples of all the normal individuals and CAD patients were analyzed for total lipid profile including serum apo-B levels. It was observed that total cholesterol and triglyceride levels more than 200 mg/

dl ($p < 0.01$, $p < 0.001$ respectively, table - 1) bring the individuals to a risk of coronary artery disease. Similarly statistical significant ($p < 0.01$) difference was observed in the case of lipoprotein levels (VLDL and LDL) with patients having raised levels of VLDL (mean $\pm$ S.D. 25.4 ± 12.39 mg%) and LDL (mean $\pm$ S.D. 140 ± 27.7 mg%) as compared to normal individuals (table 1). Serum HDL levels were found to be significantly low ($P < 0.01$; mean $\pm$ S.D. 39 ± 7.92 mg%) in CAD patients as compared to normal individuals (mean $\pm$ S.D. 46 ± 5.58 mg% ; table 1). Serum Apo-B levels were highly significantly raised in CAD patients ($p < 0.001$, mean $\pm$ S.D. 139 ± 52.31 mg%) as compared to normal individuals (mean $\pm$ S.D. 93 ± 22.95 mg% table 1).

Table 1

Comparative account of serum lipids, lipoproteins and apolipoprotein-B levels in normal individuals and patients of coronary artery disease

Subjects	No. of cases	Total cholesterol (mg%) Mean $\pm$ S.D.	TG (mg%) Mean $\pm$ S.D.	VLDL (mg%) Mean $\pm$ S.D.	LDL (mg%) Mean $\pm$ S.D.	HDL (mg%) Mean $\pm$ S.D.	Apo-B (mg%) Mean $\pm$ S.D.
Normal individuals	25	182.7 ± 30.01	103.0 ± 15.88	19.6 ± 3.10	129.0 ± 28.28	46.0 ± 5.58	93.0 ± 22.95
CAD patients	25	227.0 ± 33.97	201.0 ± 62.30	25.0 ± 12.39	140.0 ± 27.7	39.0 ± 7.92	139.0 ± 52.31

Table 2 indicated the age related variations in the levels of lipids, lipoproteins and apo-B in CAD patients and normal individuals. Grouping of individuals according to age (group I 35-45 years, group II 46-55 and group III > 55 years) revealed that serum lipid (cholesterol and triglyceride) and lipoproteins (VLDL and LDL) levels tend to increase with advancing age in both normal individuals and CAD patients ($p < 0.01$, $p < 0.001$) with patients achieving higher values at a relatively early age as compared to normal individuals (group I ; patients serum cholesterol mean $\pm$ S.D. 205.3 ± 22.1 mg%) and group II normal individuals mean $\pm$ S.D. 189.3 ± 36.17 mg%) revealing that even at the age of more than 45 years (group II) normal individuals had not achieved the mean cholesterol levels of more than 200 mg% as were achieved by CAD patients in the age of 35-45 years (group I). Similar observation was also found in case of lipoprotein levels (serum VLDL and LDL). On the other hand serum HDL level were found to decrease with advancing age in both normal individuals and CAD patients ($p < 0.01$ table 2).

On comparison within each age group it was found

that Coronary artery disease patients had significantly raised levels of serum total cholesterol and triglycerides as compared to that of normal individuals (total cholesterol $p < 0.01$, $P < 0.01$ respectively and triglycerides $p < 0.001$ in each age group, table 2).

Similarly within each age group serum VLDL ($P < 0.001$ in each age group) and LDL ($P < 0.001$, $P < 0.01$ and $P < 0.001$ respectively) levels were significantly raised in coronary artery disease patients as compared to that of normal individuals. On the other hand within each age group serum HDL levels were significantly low ($P < 0.001$, $P < 0.01$ and $P < 0.01$ respectively) in CAD patients as compared to normal individuals whereas within each age group serum apo-B levels were significantly raised ($P < 0.01$, $P < 0.001$ and $P < 0.01$ respectively) in CAD patients as compared to normal individuals table 2.

Table 3 indicated the effect of inheritance on the levels of serum lipids, lipoprotein and apo-B in both normal individuals and CAD patients. All the normal individuals ($n=25$) were having negative family history of CAD whereas in case of patients out of 25, 13 were having

Table 2

Age related variations in serum lipids, lipoproteins and apo-B levels of normal individuals and CAD patients

Age group (yrs)	Subjects	No.of cases	Total Cholesterol (mg%) Mean $\pm$ S.D.	TG (mg%) Mean $\pm$ S.D.	VLDL (mg%) Mean $\pm$ S.D.	LDL (mg%) Mean $\pm$ S.D.	HDL (mg%) Mean $\pm$ S.D.	Apo-B (mg%) Mean $\pm$ S.D.
35-45	N.Ind.	6	170.0 $\pm$ 24.56	89.0 $\pm$ 7.22	17.5 $\pm$ 1.44	115.3 $\pm$ 19.46	49.0 $\pm$ 7.37	86.0 $\pm$ 17.68
	CAD pts	7	205.3 $\pm$ 22.1	133.0 $\pm$ 31.06	26.6 $\pm$ 6.18	143.0 $\pm$ 16.25	35.4 $\pm$ 5.58	120 $\pm$ 38.45
45-55	N.Ind.	10	189.3 $\pm$ 36.17	96.0 $\pm$ 18.07	19.0 $\pm$ 3.61	125.3 $\pm$ 33.50	44.4 $\pm$ 5.61	87.0 $\pm$ 21.76
	CAD pts	7	229.0 $\pm$ 27.50	199.0 $\pm$ 60.56	38.0 $\pm$ 13.26	152.0 $\pm$ 21.60	32.0 $\pm$ 7.90	135.0 $\pm$ 42.25
55-75	N.Ind.	9	209.0 $\pm$ 21.98	122.0 $\pm$ 14.13	24.0 $\pm$ 2.17	142.0 $\pm$ 13.38	40.0 $\pm$ 5.07	114.0 $\pm$ 3.80
	CAD pts	11	239.0 $\pm$ 43.80	222.0 $\pm$ 50.88	45.0 $\pm$ 11.45	161.3 $\pm$ 30.74	30.0 $\pm$ 9.29	143.0 $\pm$ 64.72

N.Ind: Normal Individuals; CAD pts.: Coronary artery disease patients

Table 3

Inheritance pattern of variations in serum lipids, lipoproteins and apo-B levels of CAD patients and its comparison to that of normal individuals

Subjects	Family history	No.of cases	Total Cholesterol (mg%) Mean $\pm$ S.D.	TG (mg%) Mean $\pm$ S.D.	VLDL (mg%) Mean $\pm$ S.D.	LDL (mg%) Mean $\pm$ S.D.	HDL (mg%) Mean $\pm$ S.D.	Apo-B (mg%) Mean $\pm$ S.D.
N.Ind.	+ve	Nil	-	-	-	-	-	-
	-ve	25	182.7 $\pm$ 30.01	103.0 $\pm$ 15.88	19.6 $\pm$ 3.10	129.0 $\pm$ 28.28	46.0 $\pm$ 5.58	93.0 $\pm$ 22.95
CAD pts	+ve	13	243.0 $\pm$ 28.2	234.0 $\pm$ 11.70	43.0 $\pm$ 2.68	165.0 $\pm$ 30.01	35.0 $\pm$ 6.20	190.0 $\pm$ 30.1
	-ve	12	203.0 $\pm$ 20.19	148.0 $\pm$ 14.60	29.0 $\pm$ 1.24	130.0 $\pm$ 22.00	37.0 $\pm$ 4.38	100.0 $\pm$ 27.2

N.Ind: Normal Individuals; CAD pts.: Coronary artery disease patients

positive family history and 12 were having negative family history of CAD.

Serum total cholesterol levels were significantly raised ($P<0.01$) in CAD patients irrespective of the fact that family history was positive or negative ($P<0.01$ and $P<0.01$ respectively). Similarly triglyceride levels were significantly raised in CAD patients irrespective of the fact that family history was positive or negative ($P<0.001$, $P<0.01$ respectively). Similar trend was observed in case of serum VLDL levels (table 3). On the other hand serum LDL levels of patients with positive family were found to be significantly raised ($P<0.01$) when compared to that of normal individuals whereas this variation was insignificant ($P<0.04$) in CAD patients with negative family history suggesting thereby the role of some other risk factors in causation of disease in such individuals. Serum HDL levels were significantly low ($P<0.01$) in CAD patients irrespective of the fact that family history was positive or negative suggesting the loss of scavenger role of HDL in patients with CAD with or without having a family history of CAD.

Serum apo-B levels of patients with positive family history were found to be highly significantly raised ($P<0.001$) when compared to that of normal individuals whereas this variation was insignificant ($P<0.04$) in CAD patients with negative family history.

To conclude elevated serum apo-B levels (with or without hyperlipidemia) turn out to be a genetic factor responsible for causative factor of coronary artery disease. In patients with negative family history of coronary artery disease, loss of scavenger role of HDL was observed to be the chief risk factor responsible for the causation of the disease.

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