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A STUDY ON SERUM LIPID PROFILE IN HYPERTENSIVE PATIENTS OF HADOTI REGION

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ABSTRACT

Background & Objectives: There is strong association between hypertension and dyslipidemia. They increase patient's susceptibility to the development of coronary heart disease. This study is done to estimate the serum total cholesterol, triglyceride, HDL-C and LDL-C values in hypertensive patients and to study the association between hypertension and dyslipidemia.

Methodology: The study was carried out in New Medical College Hospital (NMCH), Kota, Rajasthan. The study period was from October 2013 to March 2014. 100 patients were studied. Out of them 50 were cases and 50 were controls. The patients that were included satisfied JNC VII criteria of hypertension.

Results: The study showed that TG, Total cholesterol, LDL-C, VLDL-C levels were raised in patients with hypertension in comparison to controls. HDL-C levels were decreased in patients with hypertension in comparison to controls. There was negative correlation between cholesterol and HDL-C levels in cases where as a positive correlation was seen between cholesterol and LDL-C levels.

Interpretation & Conclusion: Based on the obtained results the serum lipid profile may be useful in identification of patients at risk of hypertension. Measuring TG, Total cholesterol, LDL-C, VLDL-C levels is a useful test as it carries important prognostic information.

KEYWORDS: Cholesterol, Cardiovascular Diseases, Lipids, Hypertension, Triglycerides

INTRODUCTION

Cardiovascular diseases are increasing worldwide[1]. This increase is causing a major concern in developing countries like India. Hypertension and dyslipidemia are the two major contributing risk factors for heart diseases. They co-exist in the range of 15 to 31%[1]. Both the risk factors have an adverse impact on the vascular endothelium, which results in enhanced atherosclerosis leading to CVD[1]. Dyslipidemia is a major modifiable cardiovascular disease (CVD) risk factors[2]. It has also been identified as independent risk factors for essential hypertension[3,4]. Dyslipidemia is more common in hypertensive patients that have not been treated[5,6]. Studies have shown that total cholesterol (TC), triglycerides (TG), and all fractions of lipoproteins tend to be abnormal among hypertensive patients than in the general population[7,8,9,10]. Hypertension and lipid abnormalities act synergistically in accelerating atherosclerosis and development of CVD[11].

Hence we performed this study to examine the serum lipid patterns of hypertensive patients.

AIMS

- Estimation of Triglyceride, Cholesterol, LDL-C, HDL-C, VLDL-C levels in hypertensive and normotensive patients.
- To study the association of dyslipidemia with hypertension.
- To correlate cholesterol levels with triglycerides, HDL-C and LDL-C levels

MATERIALS AND METHODS

The study was carried out in New Medical College Hospital (NMCH), Kota, Rajasthan. The study period was from October 2013 to March2014. 100 patients of age group 30 – 60 years were studied 50 were cases and 50 controls. Patients that satisfied the JNC VII criteria for hypertension were included[12]. Those patients who had other condition known to cause raised hypertension were excluded like patients with chronic obstructive pulmonary diseases, Gout liver diseases, Diabetes Mellitus II, rheumatoid arthritis, renal disorders etc.

A written consent was taken from all patients. After a brief clinical history examination was done. Blood Pressure was measured in sitting position.

SAMPLE COLLECTION

The samples were collected in the morning after overnight fasting. The blood was allowed to clot for one hour. Centrifugation was done to separate the serum for 10 minutes. Analysis was done on fully auto analyzer EM 360 (Transasia) in Biochemistry Lab, New Medical College Hospital, Kota, Rajasthan. Safety precautions were taken while handling blood and disposing it.

Triglycerides (TG), Serum total cholesterol (TC), high density lipoprotein cholesterol (HDL-C), were determined by enzyme method.

Friedwald formula was used to calculate low density lipoprotein cholesterol (LDL-C).

CLASSIFICATION

This was done on the basis of the Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (ATP III)[11].

Table 1

Elevated TC	>200mg/dl	> 5.17mmol/L
Elevated TG	>150 mg/dl	>1.69 mmol/L
Elevated LDL-C	>130 mg/dl	>3.38 mmol/L
Low HDL-C	< 40mg/dl	< 1.03 mmol/L

STATISTICAL ANALYSIS

Statistical analysis was carried out on Microsoft excel. Continuous parameters were expressed as mean ± SD. Student´s t test was applied to the data. P value < 0.05 was considered statistically significant. Pearson correlation was done between cholesterol and triglycerides, cholesterol and HDL-C, cholesterol and LDL-C.

RESULTS

During the 6 months study period from October 2013 to March, a total of 100 patients were studied of which 50 patients were cases and 50 were controls.

The male cases were 30 and the female cases were 20. The male controls was 30 and female controls were 20 (Table 3). Study was done in age group 30 years to 60 years (Table 2).

Mean of systolic blood pressure of cases was 160.68 ± 8.577 mm Hg while it was 130 ± 7.45 mmHg in controls. Mean of diastolic blood pressure of cases was 100.36 ± 5.025 mm Hg while it was 81.78 ± 6.43 mmHg in controls. (Table 4) Cases have high levels of serum triglycerides, cholesterol, LDL, VLDL, with p value < 0.001 which is extremely statistically significant. HDL levels are low in cases as compared to controls.TG levels of controls are 124 ± 47.29 as compared to 218 ± 61.78 of cases. Cholesterol levels are 174 ± 45.67 as compared to 248.64 ±51.24 of cases. LDL-C levels are 100.66 ± 37.48 as compared to 164.78 ± 51.75 of cases. VLDL-C levels are 24.42 ±9.5 as compared to 43.9 ±12.33 of cases. HDL levels are 49.42 ±12.64 as compared to 43.9 ±12.68 of cases. P value of HDL-C is 0.032 which is less than 0.05 and hence it is statistically significant (Table 5).

Correlation

There is positive correlation between cholesterol and triglycerides, cholesterol and LDL-C in cases and controls. The correlation between cholesterol and HDL-C in controls is positive but negative in cases.

Cases' correlations (with the exception of association between TCH and LDL-C) were weak and non-significant.

Table 2: Age Distribution for Cases and Controls

Age in Years	Cases				Controls			
	N0.	%	Mean	SD	No.	%	Mean	SD
31 – 40	6	12	50.28	6.749	6	12	47.489	7.323
41 - 50	18	36			18	36		
51 - 60	26	52			26	52		
Total	50	100			50	100		

Table 3: Sex Distribution of Cases and Control

Category	Controls	Cases
Male	30	30
Female	20	20

Table 4: BP Distribution of Cases and Control

Category	Cases		Controls	
	Mean (mm Hg)	SD (mm Hg)	Mean (mm Hg)	SD(mm Hg)
Systolic	160.68	8.577	130.56	7.45
Diastolic	100.36	5.025	81.78	6.43

Table 5: Study Parameters of Cases and Controls

Study Parameters	Controls	Cases	t= value	p value
TG	124.14 ± 47.29	218.6 ± 61.78	-8.672	<0.0001
TC	174.5 ± 45.67	248.64 ± 51.24	-7.714	<0.0001

Table 5: Contd.,

LDL-C	100.66 ± 37.48	164.78 ± 51.75	-7.167	<0.0001
VLDL-C	24.42 ± 9.5	43.9 ± 12.33	-8.64	<0.0001
HDL-C	49.42 ± 12.64	43.9 ± 12.68	2.201	0.032

TG: Triglycerides; HDL-C: High density lipoprotein cholesterol; LDL-C: Low density lipoprotein cholesterol; TC: Total cholesterol; VLDL-C: Very low density lipoprotein cholesterol.
Results are presented in Mean ± SD.

Table 6: Pearson Correlation of Serum Cholesterol and Triglycerides, HDL-C, LDL-C

Pair	Controls		Cases	
	r value	p value	r value	p value
CHO vs TG	0.501199	0.0002	0.213962	0.1316
CHO vs HDL-C	0.402593	0.0035	-0.04755	0.74
CHO vs LDL-C	0.965022	0.0001	0.906695	<0.0001

DISCUSSIONS

In this study, serum TC, TG, and LDL-L concentrations are significantly higher in hypertensive patients than in normotensive subjects. High levels of serum cholesterol are known to increase the risk of developing macrovascular complications such as coronary heart disease (CHD) and stroke[13].

The activity of the Renin Angiotensin System is enhanced in hypertension. This activates mechanisms leading to dyslipidemia, inflammation and thrombosis. There is endothelial dysfunction in major atherothrombotic risk factors. Nitric oxide (NO) levels are decreased due to a decrease in its synthesis and an enhanced degradation. The expression of endothelial NO synthase (eNOS) is diminished due to oxidized LDL. Oxidized LDL also leads generation of superoxide anion by endothelial oxidase enzymes. These reacts with NO yielding a peroxynitrite ($ONOO^-$) which is toxic to proteins[16]. In hypercholesterolemia the levels of asymmetric dimethyl arginine increases which acts as an eNOS endogenous inhibitor[14].

The expression of eNOS is down regulated by Angiotensin II via protein-kinase C [15], thus leading to a decrease in NO production. Angiotensin II is also a powerful oxidant agent that increases superoxide anion production via AT1 receptors [17]. Reactive oxygen species (ROS) generated by Angiotensin II activates different intracellular signaling cascades like transcription factor NF-κB and mitogen-activated protein kinases (MAPK)[, 18] [,27]. Endothelial dysfunction causes an increase in vascular permeability to LDL. This becomes oxidized in the arterial wall where the macrophages uptake them forming the foam cells. These processes are promoted by AT1 receptor activation [19].

There is inflammatory cell recruitment into the vascular wall because of expression of adhesion and chemoattractant molecules by the endothelium , regulated by transcription factor NF-κB[. NF-κB controls the expression of many other proinflammatory and prothrombotic proteins. Reactive oxygen species and oxLDL activates NF-κB and HDL inhibits it [20, 21, 22].

Low HDL-C causes endothelial damage and can result in an increase in BP. Clinical studies have demonstrated that plasma high-density lipoprotein (HDL) level is related inversely to cardiovascular events. HDL removes excess cholesterol from cells and preventing endothelial dysfunction. Lecithin cholesterol acyltransferase (LCAT) plays a important role in the formation and maturation of HDL and reverse cholesterol transport .This is a major mechanism by

which HDL modulates the development and progression of atherosclerosis[23]. HDL-C also has antioxidant and anti inflammatory effects that prevents the atherogenic formation [24,25].

Hypertension is also a component of Metabolic Syndrome. Studying hypertension in relation to metabolic syndrome has provided significant insights into the etiology of the condition that is known to be complex and multifactorial. Although the cause of hypertension in the metabolic syndrome has not been completely understood, insulin resistance and central obesity have been recognized as the main factors involved in its pathophysiology [26].

About 60% to 70% of serum cholesterol is carried by LDL-C. It transports cholesterol from the liver to peripheral tissues. As LDL-C can build up on arterial walls leading to the formation of atherosclerotic plaques, high levels of LDL-C are harmful. LDL-C is removed from the circulation by binding with it's receptor in the liver[29]. When the intracellular cholesterol is increased it inhibits de novo synthesis of cholesterol. This results in decreased synthesis of LDL-C receptor and increased activity of an enzyme that facilitates cholesterol storage [28].

CONCLUSIONS

This study has shown that lipid abnormalities are highly prevalent among hypertensive patients in Hadoti region of Rajasthan. The treatment of hypertension should include correction of dyslipidemia and other risk factors also.

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