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Original Research Article

A Comparative Study on Lipid Profile of Hypertensive and Non-Hypertensive Patients at Sms Hospital, Jaipur

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Abstract

Background: Hypertension, also known as high or raised blood pressure, is a condition in which the blood vessels have persistently raised pressure. Clinically, Hypertension may be defined as that level of blood pressure at which the institution of therapy reduces blood pressure–related morbidity and mortality. Hypertension, the leading cause of mortality in the world, is also a simply-treatable risk factor of stroke, myocardial infarction and cardiac failure. Hypertension and dyslipidemia seem to be the two major risk factors contributing to the increasing cardio-vascular disease worldwide including India. The present study was designed to compare the Serum Triglycerides, S. Cholesterol, HDL, LDL and VLDL levels in hypertensive and non-hypertensive individuals.

Aims & Objectives: The aim of this study was to find the level of Serum Lipid Profile in hypertensive patients & their comparison with age-matched non-hypertensive controls.

Methods: This study was a cross sectional study in which clinically diagnosed cases of Hypertension from OPD/IPD of Medicine department of S.M.S. Medical College and Hospital, Jaipur were taken as cases.

Results: 120 cases of hypertension and matched controls between age group of 36-55 years were analyzed in this study. In this study Mean age in control group 44.70 + 5.74 years was slightly lower than cases group (45.80 ± 6.02). The mean Triglycerides for cases was 166.5 ± 11.78mg/dl and for Controls was 136.9 ± 10.36mg/dl which was statistically significant. The mean cholesterol for cases was 191.8 ± 14.58 mg/dl and for Controls was 169.4 ± 10.44mg/dl, mean HDL for cases was 37.7 ± 4.27mg/dl was lower than that for Controls 43.8 ± 5.17mg/dl and mean LDL for cases was 120.8 ± 15.65mg/dl) was higher than that for Controls (98.5 ± 12.36mg/dl.) which was statistically significant (p value < 0.001). A significant Pearson correlation was found between lipid profile and Blood pressure.

Conclusion: Hypertension and hypercholesterolemia (or dyslipidemia) each predisposes to CAD and their combined effects are demonstrated to be multiplicative. There is also pronounced influence of blood pressure on the rate of atheroma formation in human subjects. By the present study it may be suggested that hypertensive patients need measurement of blood pressure and lipid profile at regular intervals to prevent heart diseases and stroke.

Keywords: Hypertension, Cholesterol, Hypertension, HDL, LDL, VLDL.

Introduction

Hypertension may be defined as that level of blood pressure at which the institution of therapy reduces blood pressure–related morbidity and mortality. Current clinical criteria for defining hypertension generally are based on the average of two or more seated blood pressure readings during each of two or more outpatient visits. The latest European guidelines [1] retain the previous definition of hypertension (i.e., BP >140/90 mm Hg) whereas the American guidelines [2] (SPRINT Trials) lowered the threshold to define hypertension to >130/80 mm Hg. The Indian guidelines still continue with the previous definition of 140/90 and it is recommend that hypertension in adults, age 18 years and older, be defined as systolic blood pressure (SBP) of ≥140 mmHg and/or diastolic blood pressure (DBP) of ≥90 mmHg or any level of blood pressure in patients taking antihypertensive medication. [3, 4]

The Global Burden of Disease study has shown that non-optimal BP continues to be the biggest single risk factor contributing to the global burden of disease and to global all-cause mortality, leading to 9.4 million deaths and 212 million lost healthy life years (8.5% of the global total) each year. [5] Hypertension, the leading cause of mortality in the world, is also a simply-treatable risk factor of stroke, myocardial infarction, cardiac failure, peripheral vascular disease, aortic dissection, atrial fibrillation, and end-stage renal disease. [6]

Hypertension and dyslipidemia seem to be the two major risk factors contributing to the increasing cardio-vascular disease worldwide including India. In the broader sense, dyslipidemia includes abnormality in LDL-cholesterol, HDL-cholesterol, and triglyceride level. Dyslipidemia may impair endothelial function [7, 8], which may consequently disrupt production of nitric oxide and regulation of BP. Second, dyslipidemia may predispose individuals to development of hypertension by reducing baroreflex sensitivity. [9, 10]

The present study was designed to compare the Serum Triglycerides, S. Cholesterol, HDL, LDL and VLDL levels in hypertensive and non-hypertensive individuals as abnormalities in serum lipid and lipoprotein levels are recognized as major modifiable cardiovascular disease and hypertension risk factors. Since blood lipids and lipoproteins have been reported to be correlated with hypertension, therefore, to accumulate further evidence in Indian population, this study was designed to examine whether risk of hypertension is increased in individuals with dyslipidemia. Assessing this association will help to develop future strategies for preventing both hypertension and dyslipidemia through proper lifestyle changes or medical management or by the combination of both.

Materials and Methods

After taking Necessary permissions from the institute ethical committee and Department of Medicine, the study was conducted at Central Lab, Department of Biochemistry and Medicine OPD, SMS Medical College and hospital, Jaipur. This study was a Hospital based comparative Cross sectional study and sampling for the study was done from the period of August 2019 to November 2020.

Clinically diagnosed cases of Hypertension from OPD/IPD of Medicine department of S.M.S. Medical College and Hospital, Jaipur were taken as cases. Known and established cases of Hypertension between age group of 36- 55 years willing to participate were included in this study. Age matched healthy subjects who were willing to participate in the study giving written consent were taken as Control group.

Patients having age above 55 years and less than 36 years, having any acute illness

or diabetes mellitus, liver disease, arthritis, pulmonary tuberculosis, asthma, seizure disorder, and pregnant women and using drugs which affect serum lipid levels were excluded from the study.

Sample size was calculated at 95% confidence level, α-error 0.05 expecting SD of 80.60 mg/dl in the triglyceride level, as per reference article — Comparative Study on Lipid Profile of Hypertensive Patients and Non-hypertensive Individuals in Bikaner, Rajasthan, India to detect mean difference of at least 30 mg/dl in the TG level between hypertensive and non-hypertensive, two groups at a study power of 80%. The required sample size was 113 subjects (each group) which was further enhanced to 120 subjects in each group.

The venous blood samples were taken from study subjects after 12 hours of overnight fasting in plain vials from outdoor & indoor hypertensive Patients. Plain vial samples were kept for one hour; after that, Serum was separated at 2500 rpm centrifugation and analyzed on fully automated analyzer Beckman Coulter AU-680.

For statistical analysis the standard computer program was used for data entry& analysis. All numeric variables were expressed as Mean ±SD. Comparison of variables in different groups Were made using student`s t-test and chi-square test. P-values less than 0.05 were considered statistically significant.

Results

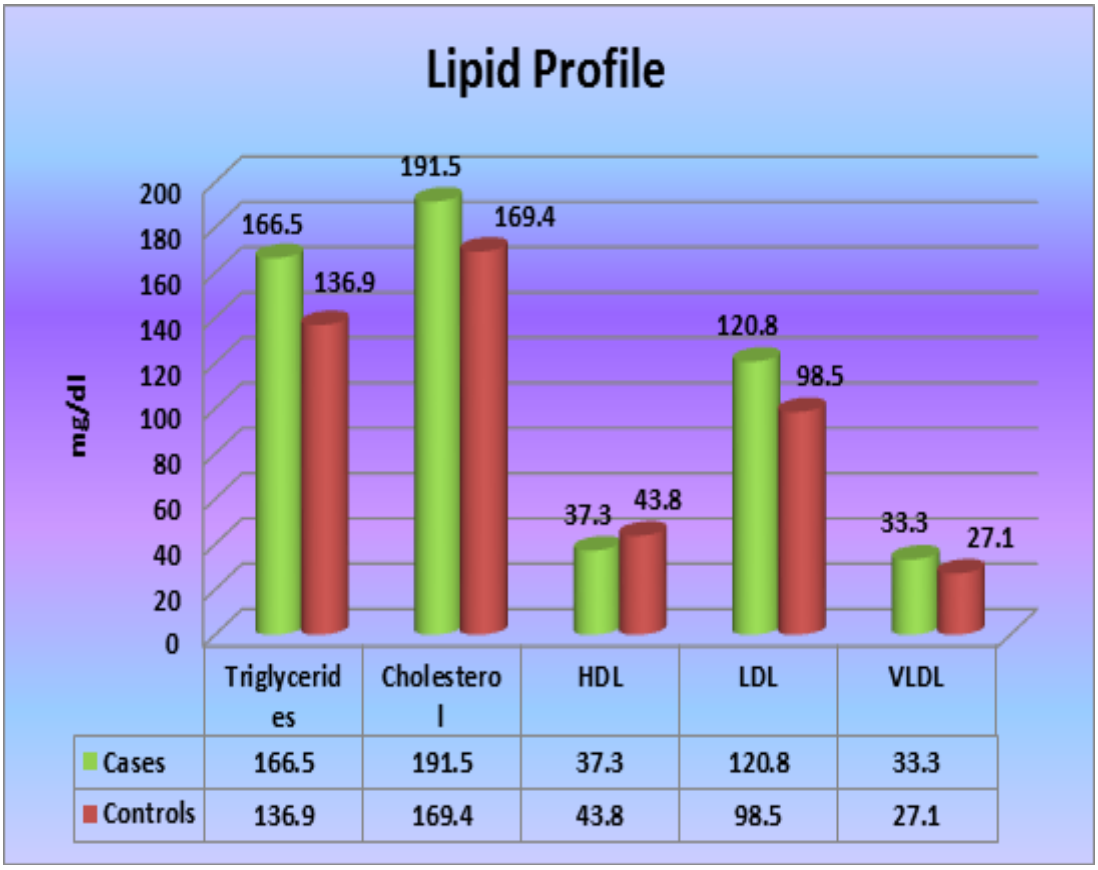
The characteristics of the studied population including age and lipid profile values are shown in Table 1.

Table 1: Results

	Group	N	Mean	Std. Deviation	'p' Value*
Age (years)	**Cases**	120	45.8	6.02	0.065(NS)
	Controls	120	44.7	5.74	
TG (mg/dl)	**Cases**	120	166.5	11.78	< 0.01 (S)
	Controls	120	136.9	10.36	
Total Cholesterol (mg/dl)	**Cases**	120	191.5	14.58	< 0.01 (S)
	Controls	120	169.4	10.44	
HDL (mg/dl)	**Cases**	120	37.7	4.27	< 0.01 (S)
	Controls	120	43.8	5.17	
LDL (mg/dl)	**Cases**	120	120.8	15.65	< 0.01 (S)
	Controls	120	98.5	12.36	
VLDL (mg/dl)	**Cases**	120	33.3	2.36	< 0.01 (S)
	Controls	120	27.1	2.06	
Systolic BP (SBP – mmHg)	**Cases**	120	164.0	16.31	< 0.01 (S)
	Controls	120	116.5	5.57	
Diastolic BP (DBP – mm Hg)	**Cases**	120	102.5	11.45	< 0.01 (S)
	Controls	120	73.2	5.50	

*Unpaired Student t-test

The mean age in cases group 45.80 ± 6.02 years was slightly more than controls group (44.7 ± 5.74 years). The mean triglycerides for cases was 166.5 ± 11.78 mg/dl and for Controls was 136.9 ± 10.36 mg/dl, mean total cholesterol for cases was 191.8 ± 14.58 mg/dl and for Controls was 169.4 ± 10.44 mg/dl, mean HDL for cases was 37.7 ± 4.27 mg/dl and for Controls was 43.8 ± 5.17 mg/dl and mean LDL for cases was 120.8 ± 15.65 mg/dl and for Controls was 98.5 ± 12.36 mg/dl and mean VLDL for cases was 33.3 ± 2.36 mg/dl and for Controls was 27.1 ± 2.06 mg/dl all of which were statistically significant (p-value < 0.01). (Table 1, Graph 1).



Graph 1: Mean Lipid Profile Comparison between Cases and Controls

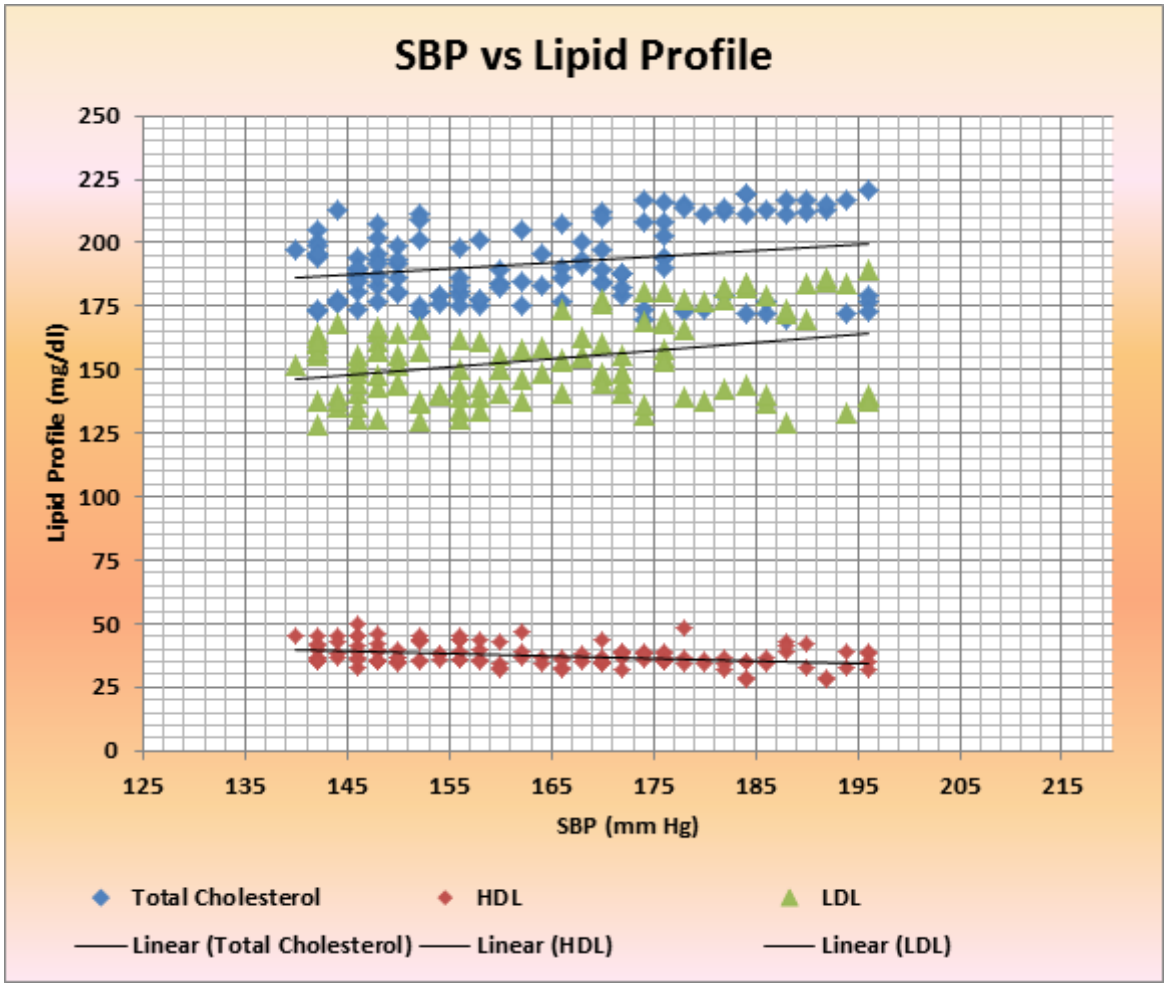
- Pearson correlation between Systolic BP and Lipid Profile

Table 2: Pearson correlation between Systolic BP & Lipid Profile in Hypertensive Patients

Parameter	P Value	R Score	R^2	Significance
SBP vs. TC	0.00383	0.2621	0.0687	S
SBP vs. HDL	0.000042	-0.365	0.1332	S
SBP vs. LDL	0.000782	0.3026	0.0916	S

*Data analysis using Pearson correlation analysis

The above table shows statistically significant Positive correlation between Systolic BP and Total Cholesterol (R = 0.2621). Similar positive correlation was seen with LDL (R = 0.3026). However, statistically significant Negative correlation was found between Systolic BP and HDL (R = -0.365).



Graph 2: Pearson Correlation between Systolic BP and Lipid Profile in Hypertensive Patients

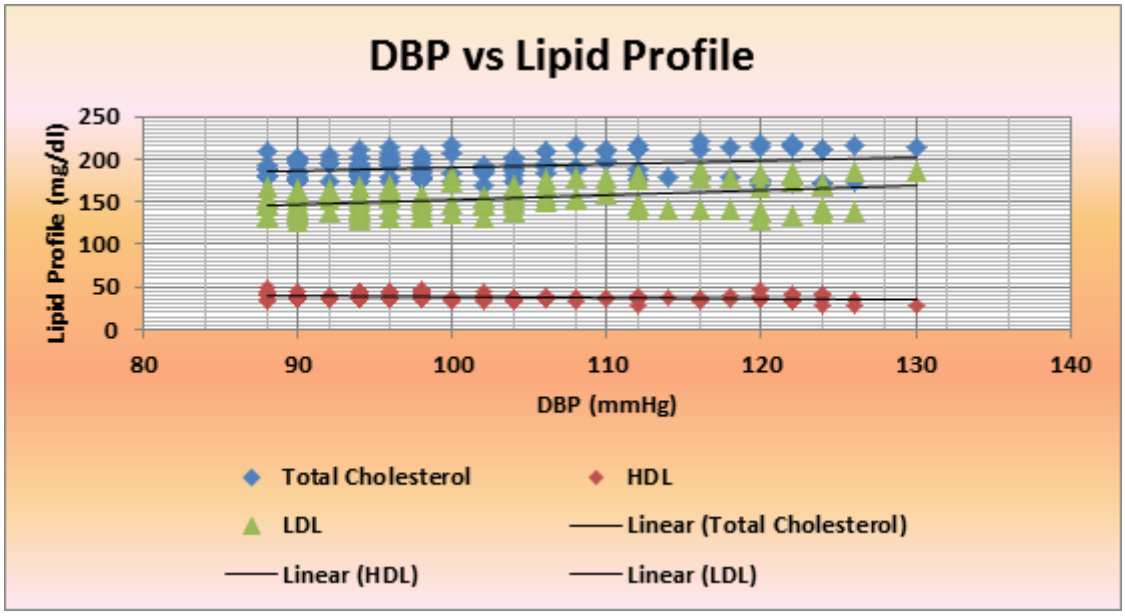
- **Pearson correlation between Diastolic BP and Lipid Profile**

Table 3: Pearson correlation between Diastolic BP & Lipid Profile in Hypertensive Patients

Parameter	P Value	R Score	R^2	Significance
DBP vs. TC	0.000582	0.3095	0.0958	S
DBP vs. HDL	0.000098	-0.348	0.1211	S
DBP vs. LDL	0.000083	0.3514	0.1235	S

*Data analysis using Pearson correlation analysis

The above table shows statistically significant Positive correlation between Diastolic BP and Total Cholesterol (R = 0.3095). Similar positive correlation was seen with LDL (R = 0.3514). However statistically significant Negative correlation was found between Diastolic BP and HDL (R = -0.348).



Graph 3: Pearson correlation between Diastolic BP & Lipid Profile in Hypertensive Patients

Discussion

Hypertension is the most important cardio vascular risk factor, contributing to one half of the coronary heart diseases and approximately two third of the cerebrovascular diseases. Hypertension has been recognized as one of ten leading reported causes of death with about 4% of such deaths due to hypertensive complications. Uncontrolled hypertension can cause damage to all organs of body. Hypertension and hypercholesterolemia (or dyslipidemia) each predisposes to CAD and their combined effects are demonstrated to be multiplicative. There is also pronounced influence of blood pressure on the rate of atheroma formation in human subjects.

Our study shows that the mean age in control group (44.70 + 5.74) years was slightly lower than cases group (45.80 ± 6.02 years). This difference was statistically not significant (p value =0.065).Cases & Controls were matched in this respect. Age was found to be an important risk factor for hypertension. As the age advanced so did the prevalence of hypertension in both the sexes. In studies by Erem C et al [11] , Tabrizi J. et al [12] and Reddy S. et al [13] , Similar findings were reported where advancing age was positively related to hypertension. In their longitudinal study, Safar et al [14] found that the relationships between SBP, DBP, and ages were linear and curvilinear, respectively, in a healthy population. With increasing age, the aorta and arteries walls will be stiffened and this contributes to the high prevalence of hypertension in older age groups [.15] The pathophysiology of both systolic/diastolic high blood pressure and isolated systolic high blood pressure in the elderly involves an increase in peripheral vascular resistance. [16, 17]

Table 1 and Graph 1 shows the values of Lipid profile among cases and controls. In our study, 120 cases and controls were studied. The cases with causes of secondary hyperlipidemia like diabetes mellitus, chronic renal failure, obesity, alcoholism & those taken drugs affecting lipid levels were eliminated from the study. The aim of the present study was to compare the lipid profile between hypertensive patients and normal subjects and to correlate lipid profile with blood pressure. Hypertension was associated with significantly higher total cholesterol,

LDL, VLDL and triglyceride levels as compared to normal subject. HDL cholesterol value is significantly lower in hypertensive patients than normal subject. This clearly shows that hypertensive patients are at increased risk of cardiovascular events as compare to normal subjects. Similar findings were observed in conducted by studies, Pyadala N et al (2017) [18], T.V. Murali Krishna et al(2016) [19] and Kavindra Borgaonkar et al (2016). [20]

Epidemiological studies done by H C McGill in 1968 indicate a progressive increase in CHD risk as the serum total cholesterol (TC) exceeds 5.0 mmol/L [21] which prompted Lewis (1986) [22] to suggest that levels of serum TC in the range 5.0–6.5 mmol/L to be considered undesirable. Similar studies were done by Joglekar et al (1997) [23] in their summary of 500 patients of hypertensive patients have shown that, 57% had TC>200 mg/dl and 47% had elevated TC/HDL ratio (>4.5). Hakim et al (1997) [24] concluded in their study on 500 hypertensives. This is unlike the findings of Akintunde (2010) [25] , Lepira et al. (2005) [26] and Kesteloot et al. (1982) [27] who reported that the TC, TG, and LDL-C of newly diagnosed hypertensive patients did not differ significantly from that of control subjects, though the newly diagnosed hypertensive tended to have a higher level of LDL-C, TG, TC.

There could be several pathophysiological mechanisms involved in the association between dyslipidemia and increased risk of hypertension. First, dyslipidemia may impair endothelial function [28], which may consequently disrupt production of nitric oxide and regulation of BP. Second, dyslipidemia may predispose individuals to development of hypertension by reducing baroreflex sensitivity. [29] The baroreflex is the regulation of BP by a negative feedback loop; Baroreceptors, located in blood vessels, activate the parasympathetic nervous system, which counteracts any changes in BP. Third, dyslipidemia decreases the distensibility of large elastic arteries. [30] This decrease may reduce the windkessel effect [30] , which, in turn, increases BP, in particular, systolic BP. The constriction and the rigidity of the blood vessel walls resulting from the buildup of cholesterol in the blood vessels can raise blood pressure will have an impact on the increased risk of CHD.

All lipid fractions have an important role in the process of atherosclerosis and are closely related to one another. Results of Iskandar's study (2017) [31] showed that there was a correlation between triglyceride cholesterol level and CHD occurrence, where the value of OR 1.99 (95% CI 0.97-1.00) was obtained, meaning that patients with high triglyceride levels had odds ratio for CHD 1.99 times greater than patients who had normal triglyceride levels.

According to Pavithran et al., 2007 [32] alterations in lipid metabolism including a decrease in HDLC can result in endothelial damage and trigger an increase in blood pressure which may partially account for its strong relation with CHD. The exact mechanism by which a low HDL-C increases CVD risk has however not been fully elucidated, though experimental studies suggested a direct role for HDL-C in promoting cholesterol efflux (this is called reverse cholesterol transport) from foam cells in the atherosclerotic plaque depots in blood vessels to the liver for excretion. [33]

Similarly, Blood Pressure is an integrated measure of steady and pulsatile pressure load. As in the present study, dyslipidemia including CHO, LDL-c and apoB may contribute to vessel stiffness and consequently lead to higher SBP and DBP.

Conclusion

The increasing levels of hypertension and its prevalence cannot be ignored as an individual’s problem. Uncontrolled

hypertension is a major cause of disability and premature death throughout the world, with significant impact on individuals and health care system. Increased blood pressure may create disturbances in lipid metabolism, Early preventive strategies like life style changes (e.g. healthy diet, regular exercise, maintaining ideal body weight, absolute avoidance of smoking, alcohol), proper medications are very essential.

Overall, our results may contribute to the accumulation of evidence that dyslipidemia increases risk of hypertension in populations. From a clinical perspective, importance of strict Blood Pressure management in patients with research studies dyslipidemia was indicated. On a large population are require to see that treatment of dyslipdemia reduces the risk of developing hypertension. This study concluded that lipid profile in hypertensive patients should be monitored as a routine so we can treat the dyslipdemia timely and future complication can be prevented.

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