

Original Research

Relationship between hypertension and serum lipid profile levels

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ABSTRACT:

Background: Hypertension is still one of the leading health problems in the world. Hypertension itself is a condition that can actually be controlled and early detection can prevent complications. Hypertension along with dyslipidemia is known as one of the major risk factors of cardiovascular disease. Previous research has shown the coexistence of abnormality in lipid profile and hypertension in patients with coronary heart disease.

Objective: To determine the correlation between serum lipid profile and blood pressure in hypertensive patients.

Method: A cross-sectional study was carried out among 150 participants including 75 normotensive controls and 75 hypertensive patients from January to October 2017 to November 2019 at SNM Memorial District Hospital Firozabad, Uttar Pradesh. Blood pressure and lipid profile including total cholesterol (TC), triglyceride (TG), low density lipoprotein (LDL), and high density lipoprotein (HDL) were recorded.

Results: The mean systolic blood pressure and diastolic blood pressure of the hypertensive participants were 154 ± 6.78 and 98 ± 9.62 respectively, which were higher than normotensives. The serum levels of TC, TG, and LDL were higher while HDL levels were lower in hypertensive subjects compared to normotensives, which was statistically significant ($P = 0.001$).

Conclusion: Hypertensive patients have a close association with dyslipidemia and need measurement of blood pressure and lipid profile at regular intervals to prevent cardiovascular disease, stroke, and other comorbidities.

Key words: hypertension, HDL, LDL, total cholesterol, triglyceride.

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INTRODUCTION:

Hypertension and dyslipidemia are major risk factors for cardiovascular disease (CVD) and account for more than 80% of deaths and disability in low- and middle income countries.^{1,2} Dyslipidemia is more common in untreated hypertensives than normotensives, and lipid levels increase as BP increases.^{3,4}

Hypertension is known to be associated with alterations in lipid metabolism which gives rise to abnormalities in serum lipid and lipoprotein levels. It has also been documented that presence of hyperlipidaemia substantially worsens the prognosis in hypertensive patients.⁵

CVD is the leading cause of disability and death worldwide, and a great majority of CVDs are associated with dyslipidemia. Worldwide, there is broad variation in serum lipid profile levels among different population groups. Increased serum levels of

TC, TG, LDL, and decreased HDL are known to be associated with major risk factors for CVD. Dyslipidemia, comprising altered ratio of high TC level and isolated elevation of the LDL or TG, is usually associated with increased blood pressure (BP) levels. There is a strong relationship between total LDL cholesterol concentrations and CVD risk. Patterns of lipid abnormalities among Asians and their relative impact on cardiovascular risk have not been well characterized.⁶

With the current trend of increasing incidence and prevalence of hypertension, CVD, and other non-communicable diseases coupled with the persistence of high rates of communicable diseases in most developing countries, these countries have been said to be experiencing a “double burden of disease.”⁷

The objective of this study was to determine the correlation between serum lipid profile and blood pressure in hypertensive patients.

MATERIAL AND METHODS:

A cross-sectional study was carried out among 150 participants including 75 normotensive controls and 75 hypertensive patients from January to October 2017 to November 2019 at SNM Memorial District Hospital Firozabad, Uttar Pradesh. The patients were divided into two groups as normotensive controls and hypertensive group. Blood pressure and lipid profile including total cholesterol (TC), triglyceride (TG), low density lipoprotein (LDL), and high density lipoprotein (HDL) were recorded. All the participants were aged between 30–60 years. Participants were selected consecutively from the outpatient department by the attending physician.

Exclusion criteria:

1. Patients with features of Cardiac, renal or hepatic complications or major medical problems.
2. Patients on lipid lowering and antihypertensive medications.

After obtaining oral and written informed consent, data was collected through face-to-face interviews, clinical examinations and blood tests for serum lipid profile by trained research assistants. An informed signed consent was needed to be recruited into the

study and those who refused were not recruited into the study. BP was measured by a physician after the patient had rested for 10 minutes. Blood pressure was taken on the left arm after 5 minutes' relaxation, in a sitting position, using a standard mercury sphygmomanometer with appropriate cuff size; systolic (SBP) and diastolic (DBP) blood pressures corresponded to Korotkoff sounds 1 and V, respectively. The average of three readings, taken at first visit, was used for further analysis.

Fasting serum lipid profile were determined using a 12-mL sample of blood obtained from an antecubital vein following an overnight (i.e., about 9–12-hour) fast. Serum total cholesterol (TC), high density lipoprotein cholesterol (HDL-C), and triglycerides (TG) were determined enzymatically, while low density lipoprotein cholesterol (LDL-C) was calculated using the Friedwald formula.

RESULTS:

The mean systolic blood pressure and diastolic blood pressure of the hypertensive participants were 154 ± 6.78 and 98 ± 9.62 respectively, which were higher than normotensives. The mean age of normotensives and hypertensive patients were 40.23 ± 6.93 and 54.15 ± 9.51 years, respectively.

TABLE 1: MEAN TOTAL CHOLESTROL

PARAMETER	N=150	MEAN	P VALUE
T.Cholestrol	Normotensive	162.12±33.14	0.0001
	Hypertensive	189.74±37.42	

TABLE: 2 MEAN TRIGLYCERIDE

PARAMETER	N=150	MEAN	P VALUE
TGL	Normotensive	116.73±14.17	0.03
	Hypertensive	132.1±19.14	

TABLE: 3 MEAN LDL

PARAMETER	N=150	MEAN	P VALUE
LDL	Normotensive	95.01±9.78	0.002
	Hypertensive	115.56±11.42	

TABLE: 4 MEAN HDL

PARAMETER	N=150	MEAN	P VALUE
HDL	Normotensive	45.36±8.74	0.001
	Hypertensive	35.34±8.12	

TABLE 5: Correlation of Serum lipids levels with increased systolic BP.

Variables tested for correlations	Pearsons correlation (P-value)
Triglycerides	0.01
Total Cholesterol	0.019
LDL	0.012
HDL	0.04

TABLE 6: Correlation of Serum lipids levels with increased diastolic BP.

Variables tested for correlations	Pearsons correlation (P-value)
Triglycerides	0.015
Total Cholesterol	0.027
LDL	0.001
HDL	0.037

DISCUSSION:

Hypertension is recognized globally as a major risk factor for CVD, stroke, diabetes, and renal diseases. About 80% of hypertensive persons have comorbidities such as obesity, glucose intolerance and abnormalities in lipid metabolism, among others.⁸ The consistent positive relation between blood pressure and serum lipid within population strata suggests that there is a biological interrelation between these two.

In this study, we investigated the relationship between serum lipid profile and hypertension among the individuals. Results of this study revealed that the mean value of serum total cholesterol, triglyceride and LDL were significantly higher in hypertensive patients as compared to normotensives individuals. This is in concordance with the studies done by Osuji CU et al⁷ and Chobanian AV et al⁹. High levels of serum cholesterol are known to increase the risk of developing macrovascular complications such as coronary heart disease (CHD) and stroke.¹⁰

The present study reveals a strong relation between dyslipidemia and hypertension. It may lead to the development of coronary heart diseases. In our study, mean HDL levels were significantly higher in normotensives compared to hypertensive subjects. Similar findings were observed by Osuji CU et al⁷ and Lakhshankumar N et al.¹¹ Hypertension and dyslipidemia, coexisting in 15%–31%, are the two major risk factors for CVD. These risk factors have an adverse effect on the vascular endothelium, which results in enhanced atherosclerosis resulting in CVD. Abnormalities in serum lipid levels can be recognized as a major modifiable CVD risk factor and has been identified as a risk factor for essential hypertension giving rise to the term dyslipidemic hypertension.¹²

Hypertension is not the mere determinant of damage of cardiovascular system, and the likelihood of hypertensive patients, with uncontrolled blood pressure, to develop target organ damage is markedly affected by coexisting risk factors. Among them, lipoproteins are heavily implicated in the atherosclerotic process and greatly influence the impact of hypertension on development of target organ injury and hence cardiovascular morbidity and mortality.¹³

The management of these disorders, particularly in high-risk patients, requires multiple interventions, including dietary and pharmacological. There is a need to increase the awareness, both in the medical and patient communities, for early detection and treatment of these two conditions to decrease the incidence of future CAD.¹⁴

CONCLUSION:

The results of present study demonstrate that patients with hypertension are more likely than normotensive patients to exhibit dyslipidemia, including elevated total cholesterol, triglyceride, LDL and reduced HDL levels. These patients need measurement of blood pressure and lipid profile at regular intervals to

prevent cardiovascular disease, stroke, and other comorbidities.

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