

Correlation of Serum Uric Acid Levels with Serum Cholesterol Levels in Patients Suffering from Hypertension

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Conflict of interest: Nil

Abstract:

Background: Hypertension is a sustained elevation of systemic arterial pressure. Hypertension is a risk factor for cardiovascular mortality and morbidity, prevention of its complication, and early diagnosis and intervention are warranted. Serum uric acid has been proposed to be an index of severity as well as the risk factor for morbidity and mortality of essential hypertension.

Objective: To assess the possibility of detecting serum uric acid level and lipid profile status as risk factors in borderline essential hypertension.

Method: Hypertensive subjects were taken up for the study who attended the department of General Medicine with the age group 30-70 years and controls were selected from the staff members of the same college. Selection of subjects was done on basis of recently established hypertensive patients with elevated lipid profile. Blood was drawn after an overnight fast of 10-12 hours. Serum was separated and stored at -20°C till further analysis of parameters i.e. Total Cholesterol, Triglycerides, HDL-Cholesterol, LDL-Cholesterol, VLDL-Cholesterol and Serum Uric Acid.

Results: The comparative analysis of the parameters provided with significant relation with hypertensive patients when compared to controls.

Conclusion: The results of the study were comparable to the other studies performed related to the subject and backing the theory of hyperuricemia detected in one-third of the patients with essential hypertension and Hyperuricemia is positively correlated to hypertriglyceridemia and hypercholesterolemia.

Keywords: Uric Acid, Cholesterol, Lipids, Hypertension, Hyperuricemia.

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Introduction

The sustained exertion of pressures on the vessel walls that is greater than normal is known as hypertension. As per guidelines, for diagnosis of hypertension systolic blood pressure more than 140 mmHg with or without diastolic blood pressure greater than 90 mmHg is considered. [2, 11, 13, 19] Currently, the prevalence of hypertension in India is 59.9 and 69.9 per thousand males and females respectively in urban areas; and 35.5 and 35.9 per thousand males and females respectively in pastoral populations.

Nearly 90% of cases present with no known etiology and are diagnosed as Essential Hypertension. [2, 6, 8] Hypertension is considered a major risk factor for cardiovascular mortality and morbidity and so, early diagnosis and treatment are necessary to prevent complications. [4, 7, 8] It has been hypothesized that serum uric acid is both a risk factor for essential hypertension morbidity and mortality and a sign of rigidity. Uric acid's ability to prevent thrombosis and stabilize platelet

aggregation is a possible explanation, for the correlation of hyperuricemia with hypertension and hypertriglyceridemia. [3,8,12] An increase in serum uric acid level increases the production of oxygen-free radicals, which are crucial for the progression of atherosclerosis. As a result, the purpose of this study was to determine the status of lipid profile and serum uric acid as risk factors in patients with essential hypertension. [1,6,10,14]

Methodology

The study was carried out by the Department of Biochemistry and Central Laboratory Department, Sri Aurobindo Institute of Medical Sciences, Indore. Ethical permission for the study was taken from Human Research Ethical Committee (HREC) before starting the study.

Study Group: This was a case-control study, in which cases of hypertension and identical control were selected. So, two groups were included in the study i.e. Cases and Controls). Total 50 numbers of

patients with a diagnosis of Hypertension that follow the below-mentioned inclusion and exclusion criteria were selected for the study from the In-patient and Out-patient departments of the General Medicine Department.

The identical controls were selected from the staff members of the same college. The age group of all participants was between 30-70 years. Blood pressure measurement of subjects was carried out according to the recommendations of the American Heart Association.

Inclusion Criteria: All Patients who fall in the group of Essential Hypertension according to the American Heart Association.

Exclusion criteria: Patients with secondary hypertension, Patients on other chronic medication, and pregnant or lactating women with a history of any other clinical complication were excluded from the study. Before enrolment in the study, written informed consent was taken from all the participants. The blood sample was collected after an overnight fast of 10-12 hours from all the participants.

Serum was separated and stored at -20°C till further analysis.

The laboratory parameters are estimated and compared were:

(A) Lipid Profile

1. Total Cholesterol (TC) by enzymatic endpoint CHOD-PAP method.
2. Triglycerides (TG) by Enzymatic Glycerol Phosphate Oxidase/ Peroxidase method.
3. HDL-Cholesterol (HDL-C) by Homogenous Enzymatic Direct Assay.
4. LDL-Cholesterol (LDL-C) by Homogenous Enzymatic Direct Assay.
5. VLDL-Cholesterol (LDL-C) obtained by Friedewald calculation.

(B) Serum Uric Acid

The above parameters were analyzed on the fully Automated Machine.

Results

Table 1: Age wise distribution of all cases and controls

S.NO.	Age group intervals(Years)	Cases	Controls
1	30-40	5	20
2	41-50	11	16
3	51-60	15	8
4	61-70	19	6
Total		50	50

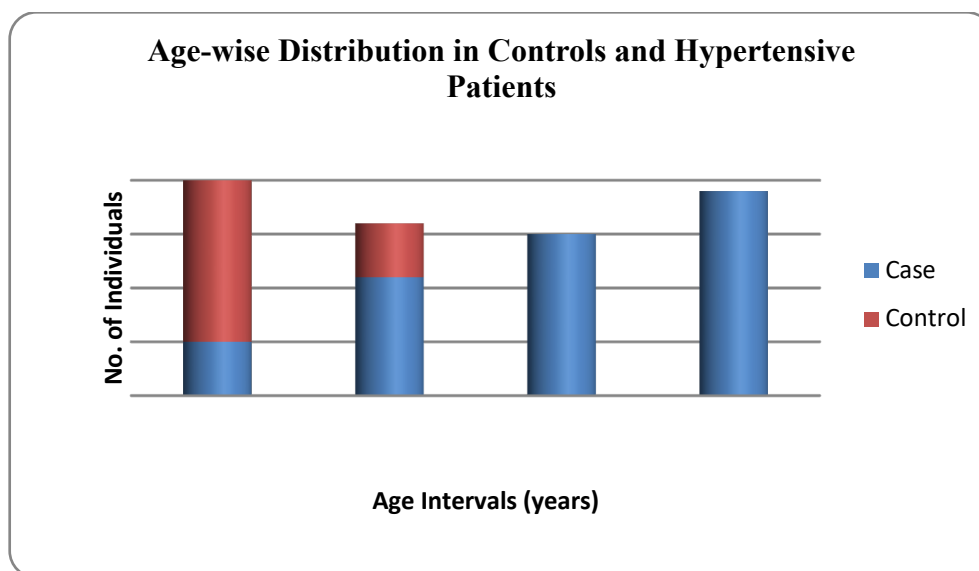


Figure 1: Age-Wise Distribution in Controls and Hypertensive Patients

As per inclusion and exclusion criteria, total 50 numbers of hypertensive cases and 50 controls were included in the present study. All participants were examined clinically including measurement of blood pressure. Also, laboratory investigations

including lipid profile and serum uric acid were done for all the participants. The control and hypertensive cases are in the age group of 30-70 years. There was no significant change in the age of the groups (table-1; fig: 1).

Table 2: Gender wise distribution of control and cases

Group	Males		Females	
	Number	%	Number	%
Cases	28	56	22	44
Control	29	58	21	42

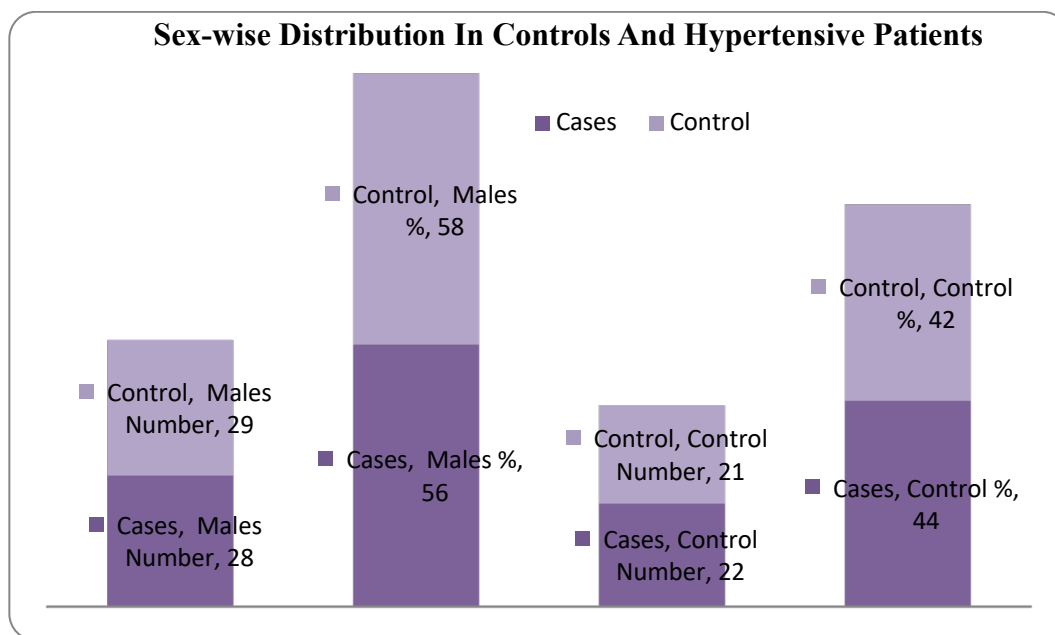


Figure 2: Sex-wise Distribution in Controls and Hypertensive Patients

Among the cases i.e. hypertensive patients, 28 are males and 22 are females, while in the control group i.e. in healthy volunteers 29 are males and 21 are females (table-2; fig: 2).

Table 3: SBP and DBP in Controls and Hypertensive Patients

Group Status		Systolic Blood Pressure (mmHg)	Diastolic Blood Pressure (mmHg)
Control (n=50)	Mean	120.9	76.8
	SD	5.45	1.02
Case (n=50)	Mean	181.2	99
	SD	16.02	18.12

***p<0.001 when compared with Control

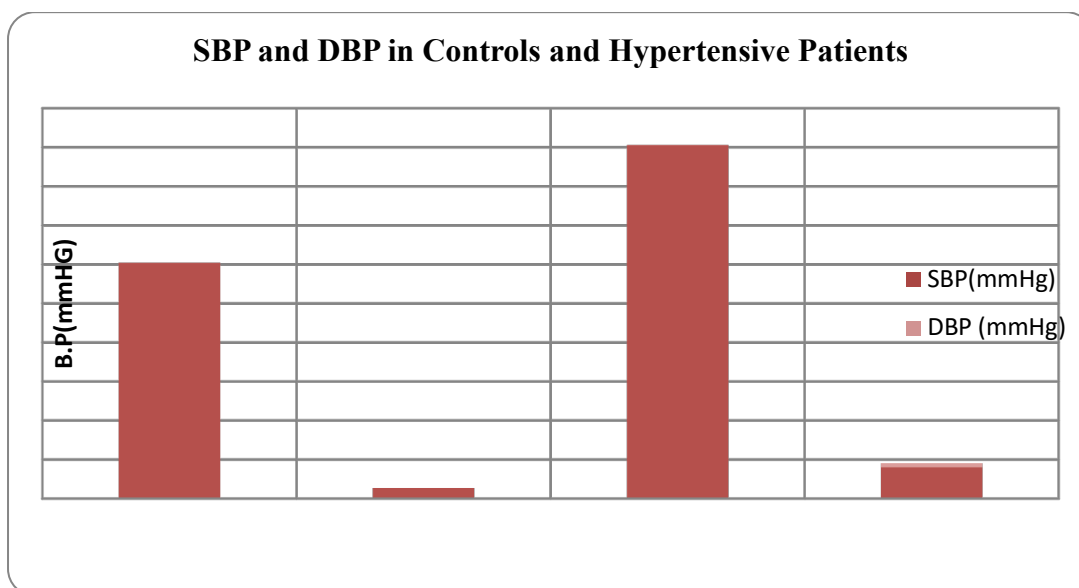


Figure 3: SBP and DBP in Controls and Hypertensive Patients

Systolic, Diastolic, and Mean Blood Pressure were measured and compared among the cases and control. The average SBP of the hypertensive subjects is 181.2+/-16.02 mm Hg and that of the controls is 120.9+/-5.54 mmHg. The average SBP is higher in hypertensive subjects than in controls (p<0.001). The average DBP of hypertensive cases is 99.0+/-1.02 mmHg. The average of cases is higher than controls (p<0.001) (table-3; fig: 3).

Table 4: Lipid Parameters and Serum Uric Acid in Controls and Hypertensive Patients

Group	Control (n=50)		Case (n=50)	
	Mean	SD	Mean	SD
Cholesterol (mg/dl)	152.2	10.13	266.3	8.73
HDL (mg/dl)	45.2	5.42	39.2	6.5
LDL (mg/dl)	107.9	7.59	155.8	6.59
VLDL (mg/dl)	23.1	3.66	39.2	5.82
TG (mg/dl)	139.4	12.85	199.5	15.91
Uric Acid (mg/dl)	4.3	0.89	8.01	1.25

*p<0.05, ***p<0.001 when compared with control

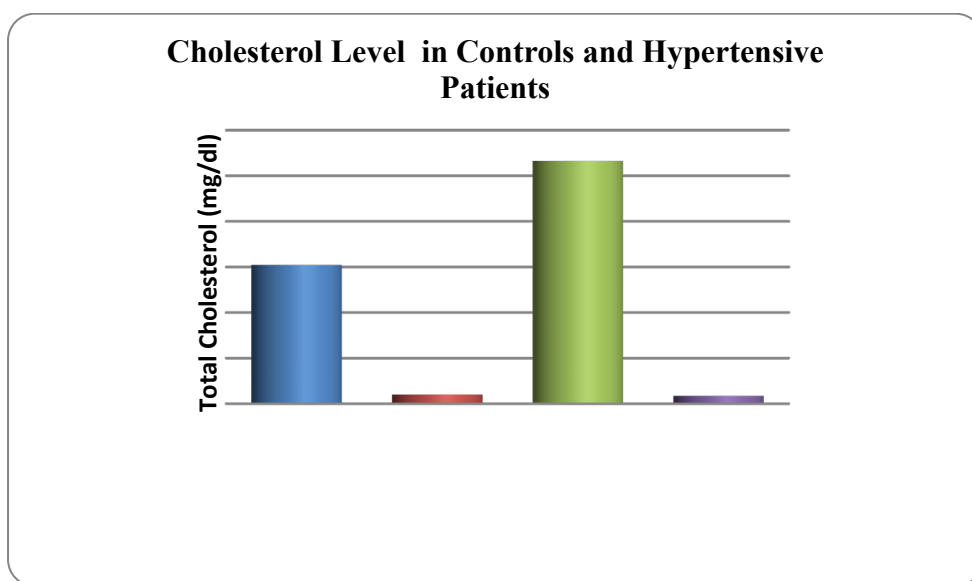


Figure 4: Cholesterol Level in Controls and Hypertensive Patients

The mean of total cholesterol in hypertensive cases is 266.3+/-8.58 mg/dl and controls are 152.2+/-10.13 mg/dl and were significantly higher (p<0.001) (table-4; fig: 4).

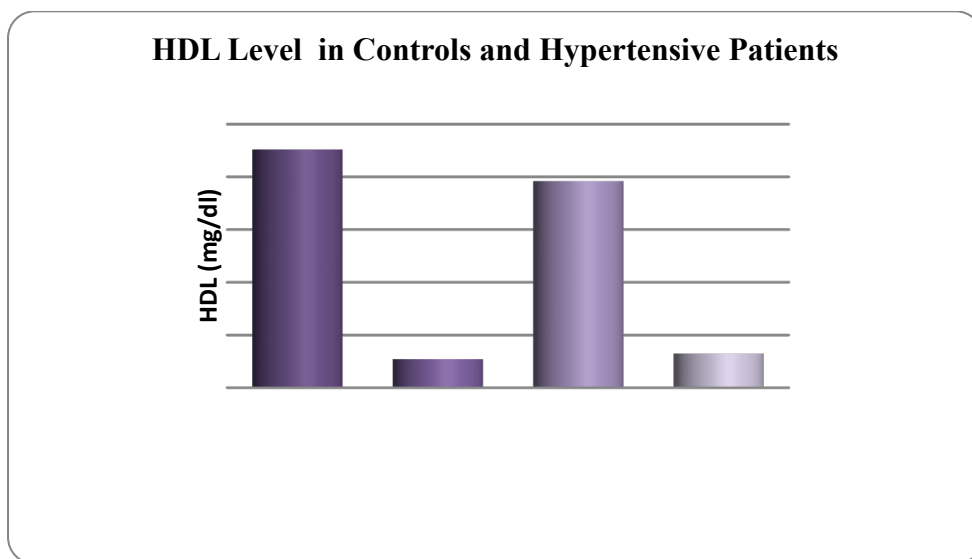


Figure 5: HDL Level in Controls and Hypertensive Patients

The mean HDL of hypertensive cases is 39.2±6.52 mg/dl and that of controls is 45.20±5.46 mg/dl. The increase in mean of HDL in controls than cases is statistically significant (p<0.05; fig: 5).

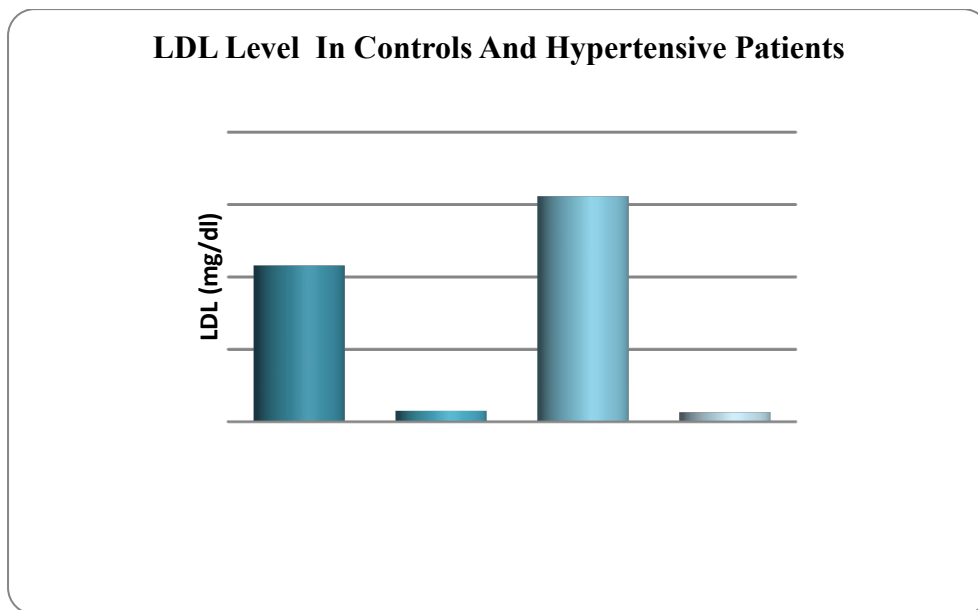


Figure 6: LDL Level In Controls And Hypertensive Patients

The mean HDL of hypertensive cases is 155.8±6.53 mg/dl. The mean LDL of controls is 107.9±7.56 mg/dl. The mean LDL of cases is higher than controls (p<0.001) (table-4, fig: 6).

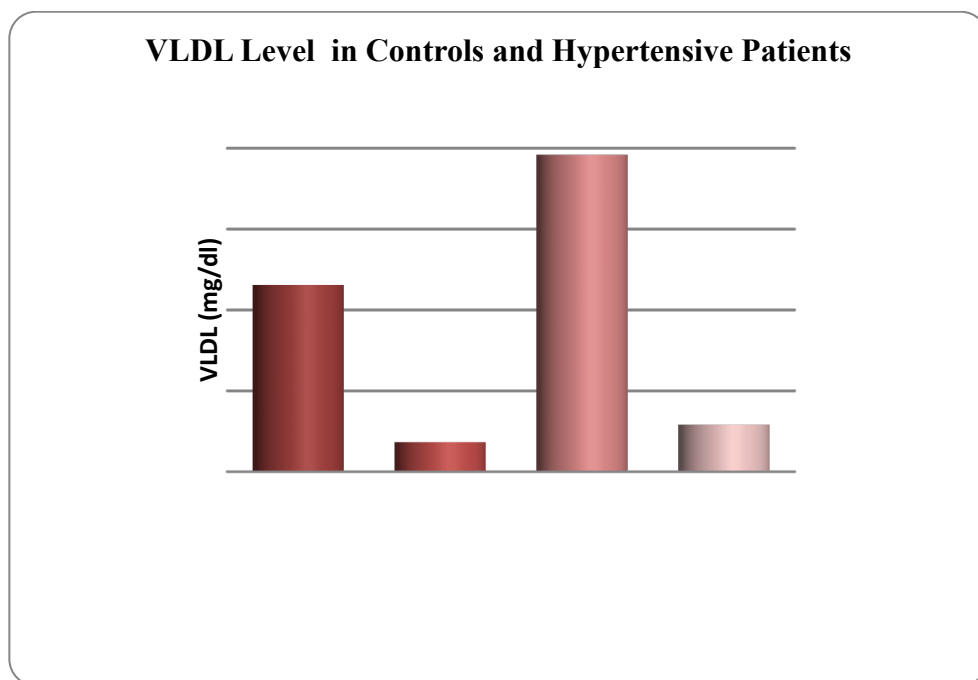


Figure 7: VLDL Level in Controls and Hypertensive Patients

The VLDL levels were found in hypertensive cases and control to be 39.2±5.68 mg/dl and 23.1±3.65 mg/dl respectively and were significant (p<0.001) when compared with controls (table-4; fig: 7).

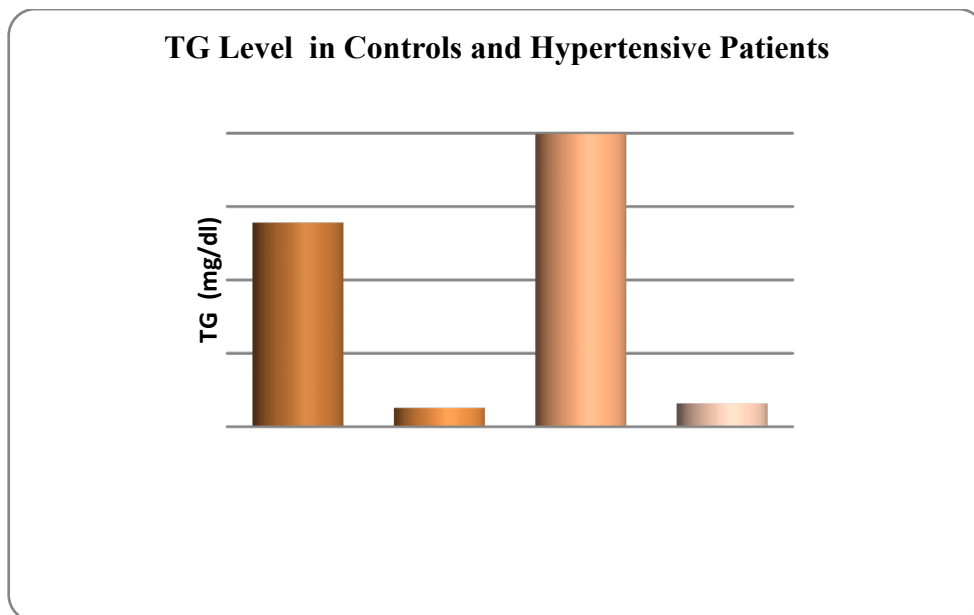


Figure 8: TG Level in Controls and Hypertensive Patients

The mean TG of hypertensive subjects is 199.5+/-14.25 mg/dl and that of control is 139.4+/-12.36 mg/dl. The mean TG cases are higher than controls (p<0.001) (table-4; fig: 8).

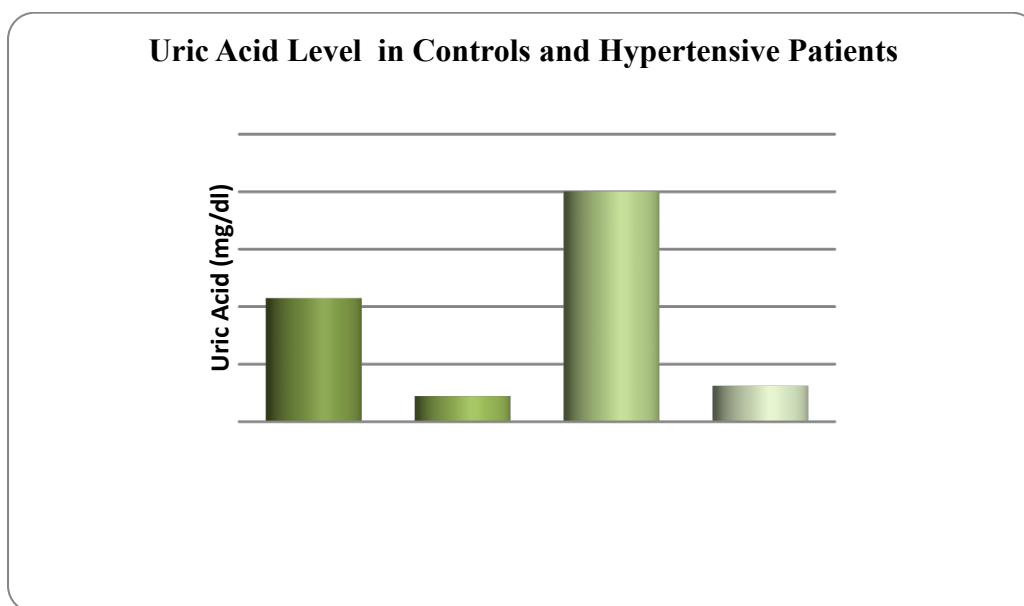


Figure 9: Uric Acid Level in Controls and Hypertensive Patients

The serum uric acid levels found in hypertensive cases and controls were 8.01+/-1.23 mg/dl and 4.3+/-0.36 mg/dl respectively and were significant (p<0.001) (table-4; fig: 9).

Discussion

Serum uric acid has been linked to the risk of gout, hypertension, coronary heart disease, and diabetes mellitus in clinical and epidemiological studies. [1,4,17] The correlation between hyperuricemia in hypertensive patients with Peripheral Arterial Disease in the study by Michel Langlois, titled "Serum uric acid in hypertensive patients with and

without peripheral arterial disease," was established. [15] Another study by Cicero AFG, titled "High serum uric acid is associated with poorly controlled blood pressure and higher arterial stiffness in hypertensive subjects," suggested that elevated serum uric acid levels were a factor in both elevated arterial stiffness and inadequate blood pressure control. [8] Concluding that Hypertensive patients had significantly elevated levels of serum uric acid, serum cholesterol, triacylglycerol, LDL-c, and VLDL-c, but patients with high blood pressure had elevated levels of serum uric acid independent of other parameters

suggestive of Serum uric acid to be a potential biomarker for determining the diagnosis and prognosis of hypertensive patients, according to these comparative studies. [3,14,12,16]

Conclusion

Serum uric acid levels in patients are significantly higher than those in healthy people, according to the analysis of studies conducted in various parts of the world. In conclusion, hypertensive patients had significantly higher serum levels of uric acid, regardless of the patient's lipid profiles. [1,19]

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