

Lipid profile in hypertensive patients under diuretic therapy

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Abstract

Hypertension is a major health hazard of present day life and is a leading cause of global burden of disease. There is close association of hypertensive patient with dislipidemia. Low dose thiazide diuretics are used as first line agents alone or in combination with other antihypertensive drugs. Thiazide and loop diuretics increase triglycerides, total cholesterol, LDL cholesterol and VLDL cholesterol.

Keywords: Hypertension, Lipid Profile, Triglyceride, HDL, LDL, VLDL, Total Cholesterol, Diuretics

Introduction

Hypertension is a major health hazard of present day life and is a leading cause of global burden of disease. Approximately 7.6 million death and 92 million disability adjusted life years worldwide were attributed to a high BP in 2001. Hypertension is defined as increase in blood pressure and it is classified as primary hypertension and secondary hypertension.¹ Both environment and genetic factors contribute to regional and racial variation in blood pressure and hypertension.¹ Some of the known risk factors for primary hypertension like age, hereditary and gender are non-modifiable. However, majority of other risk factor like tobacco use, alcohol use, unhealthy diet, physical inactivity, overweight and obesity can effectively be prevented.² Beside various risk factors there is importance of a lipid profile in hypertensive patients. The routine monitoring of lipid profile in hypertensive patients is important for coronary heart diseases and other consequences to combat morbidity and mortality.³ There is close association of hypertensive patient with dislipidemia and meets measurement of blood pressure and lipid profile at regular intervals to prevent cardiovascular disease, stroke and other co morbidities.⁴ Diuretics are the drugs which block the resorption of sodium and chloride by renal tubules and increase the urinary volume. They are widely used in the treatment of hypertension. Low dose thiazide diuretics are used as first line agents alone or in combination with other antihypertensive drugs. Thiazide inhibits Na⁺ / Cl⁻ pump in distal convoluted tubule and hence increased sodium excretion. Other diuretics like potassium sparing diuretic, amiloride and triamterene act by inhibiting epithelial sodium channel in the distal nephron.⁵ Certain drugs used for hypertensive therapy can further modify lipoprotein and glucose metabolism.⁶ The present study was conducted to find out variation in some biochemical parameters like serum triglyceride, total cholesterol, HDL-cholesterol, LDL-cholesterol and VLDL-cholesterol level under diuretic therapy in relation to hypertension.

Material and Methodology

The present study was conducted to observe the changes in serum lipid profile among hypertensive patients compared with healthy individuals of same group: Control subject for this study were students and attendants of the patient who were compared with 25 patients suffering from hypertension and taking diuretics. The subjects are divided into two groups. Group A which comprises of 25 persons as control and Group B which comprises of twenty five hypertensive patients taking diuretics as antihypertensive drugs.

Following investigations are carried out in all subjects:

1. Estimation of total serum cholesterol by method of Zlatkis Modified Zak.⁷
2. Estimation of serum HDL-cholesterol by Burstein et al.⁸
3. Estimation of serum triglyceride by calorimetric method using Hantasche Reaction by Foster et al.⁹
4. Estimation of serum LDL- cholesterol by Wilson et al.
5. Estimation of serum VLDL – cholesterol by Wilson et al.

Collection of sample: Samples were taken after 20 hrs of fasting with NO.20 needle from interior cubital vein. Haemolysed samples were discarded. Serums were separated from blood clot and above mentioned investigations were carried out on these samples.

The methodology involves taking of three centrifuge tubes and marking them Test, Standard and Blank respectively followed by investigations which were carried out on the basis of estimation methods cited above for serum cholesterol, HDL – cholesterol, Triglyceride, LDL- cholesterol and VLDL – cholesterol.

Group A comprises of 25 healthy individuals selected randomly between age groups of 20 – 80 years including males and females.

Group B comprises of 25 hypertensive patients on diuretics therapy which were selected randomly

between age groups of 20-80 years including males and females.

Table 1: The mean value of serum lipid in healthy individuals as

Parameter	Serum Tg mg %	Serum cholesterol mg %	HDL-cholesterol mg%	LDL – cholesterol mg %	VLDL - cholesterol
Mean	116.1	197	42.3	131.4	23.3

Table 2: Level of lipid in hypertensive individuals taking diuretics

Parameter	Serum Tg mg %	serum cholesterol mg %	HDL-cholesterol mg%	LDL – cholesterol mg %	VLDL - cholesterol
Mean	256.5	297.9	54.8	190.2	52.9

Table 1 and 2 shows the mean value of various components of serum lipid profile in the healthy and hypertensive individuals.

Table 3: Comparative study of serum cholesterol in healthy and diseased individuals

S No.	No. of cases	Group	Serum Cholesterol	Standard deviation	Standard Error
1.	25	Healthy individual	197.0	22.96	4.593
2.	25	Diseased individual	297.9	58.48	11.697

$T = 7.865, p < 0.001$

The above data shows the comparative value of serum cholesterol in the diseased individual were significantly higher as compared to healthy individuals were 197.0 mg % where as in diseased individual was 297.9 mg %. The p value was significantly high.

Table 4: Comparative study of stg in healthy and diseased individuals

S. No.	No of cases	Group	Serum Triglyceride	Standard Derivation	Standard Error
1.	25	Healthy individual	116.14	24.824	4.964
2.	25	Diseased individual	256.5	88.133	17.62

$t = 7.508, p < 0.001$

The serum tg from above data in diseased individual was higher 256.5 mg % as compared to healthy individual 116.14 mg %. The result was highly significant as p value was < 0.001 .

Table 5: Comparative study of serum hdl- cholesterol in healthy and diseased individuals

S. No.	No. of cases	Group	s hdl - cholesterol	Standard Deviation	Standard Error
1.	25	Healthy individual	42.32	10.194	2.038
2.	25	Diseased individual	54.84	16.597	3.319

$t = 3.149, p < 0.01$

The above data shows that serum hdl – cholesterol in both groups was within normal range i.e. 40–80 mg % as compared to healthy individuals were 54.84 mg % as compared to healthy individuals. The hdl cholesterol was significant as its p – value is found to < 0.01 .

Table 6: Comparative study of serum ldl – cholesterol in healthy and diseased individuals

S. No.	No. of cases	Group	S ldl - cholesterol	Standard Deviation	Standard Error
1.	25	Healthy individual	131.43	15.776	3.155
2.	25	Diseased individual	190.21	41.164	8.232

$t = 6.531, p < 0.001$

The above data shows that serum ldl – cholesterol in diseased individual was higher, 190.21 as compared to healthy individual's 131.437 mg %. The increase was highly significant as its p – value is found to be < 0.001 .

Table 7: Comparative study of serum vldl cholesterol in healthy and diseased individuals

S. No.	No. of cases	Group	S vldl - cholesterol	Standard Deviation	Standard Error
1.	25	Healthy individual	23.27	4.921	0.984
2.	25	Diseased individual	52.89	19.098	3.819

$t = 7.357, p < 0.001$

From the above data it was found that serum vldl – cholesterol in diseased individual was higher 52.89 mg % as compared to healthy individuals was 23.27mg %. The increase was found to be highly significant as its value was found to be highly significant as its p-value was found to be < 0.001 .

Discussion

Hypertension is generally associated with cardiac function and elevated peripheral resistance therefore it seems logical to reduce both cardiac activity and vascular tone when managing the hypertensive patient with diuretics as antihypertensive drugs. Lipids are a heterogeneous group of compounds which are important dietary constituents not only because of their high energy value but also because of the fat soluble vitamins and the essential fatty acids contain in the fat of natural foods. The plasma lipid after subsequent separation of the extract into various classes of lipid shows the presence of triglycerols phospholipids, cholesterol and cholesteryl esters and in addition of existence of small fraction of free fatty acid and these free fatty acids are known to be metabolically most active of plasma lipids. In addition to free fatty acids four major groups of lipoproteins have been identified that are important physiologically and in clinical diagnosis. These are chylomicrons, VLDL, LDL and HDL.¹¹ The disturbance of lipid metabolism is seen in some inherited diseases and also in patients of some kind of underline diseases. The presence of its disturbance can be detected by measuring concentration of cholesterol and triglyceride in serum. Although hyperlipidemia or hypolipidemia is the result of abnormal lipid metabolism. Hyperlipidemia is more concerned with physicians because of its close association with atherosclerosis.¹²

Disorders of the lipid metabolism may be caused by defects in structural proteins of lipoproteins particles, in the cells receptor that recognize the various types of lipoproteins or in the enzymes that break down fats. As a result of such defects lipid may become deposited in the walls of blood vessels which can lead to atherosclerosis.¹³ Hypertension and altered lipoprotein metabolism are two major risk factors for coronary heart disease. Unfavorable lipoprotein changes following thiazide diuretic have been revealed by adverse effects of diuretic on lipoprotein profile in studies with small number of subjects for a short period of time. Thiazide diuretic cause an increase in serum cholesterol, serum triglyceride, serum LDL and VLDL.¹⁴ In the present study all 25 hypertensive

patients under treatment with diuretics, serum cholesterol, serum triglyceride, serum HDL, serum VLDL and serum LDL were estimated and compared with healthy controls of same age group. As shown in Table 3 there is significant rise of serum cholesterol in diseased subjects on diuretic therapy, it is well supported by Richard H, that thiazide diuretics increase total cholesterol, LDL cholesterol and triglyceride levels.¹⁵ Peter Weidmann et al in their study proved that various diuretics can significantly increase LDL, VLDL and total cholesterol level. Triglycerides are also often elevated.¹⁶

The significant rise in serum triglyceride in case of hypertensive patients on diuretic therapy as depicted by Table 4, the recent studies on the effect of thiazide diuretics show that short term thiazide diuretics produce an increase in plasma triglyceride and cholesterol and LDL cholesterol.¹⁷ It is also supported by the studies of Ames and Hill (1976) that thiazide diuretics are associated with rise in plasma triglyceride and cholesterol.¹⁴ Levels of HDL have shown an increase in present study among the hypertensive patients on diuretics, which is clear as per Table 5. Study on hypertension and atherosclerosis have shown the cholesterol level to decrease by 6-7 mg/dl in both verapamil and thiazide groups, HDL cholesterol levels increased by 1-5 and 0.1 mg/dl respectively.¹⁸ Present study also shows an increase in the level of LDL cholesterol and VLDL cholesterol as depicted in Table 6 and Table 7. This is in accordance with the study of Peter Weidman et al that various diuretics can significantly increase LDL cholesterol, VLDL cholesterol and total cholesterol.¹⁶ Thiazide and loop diuretics increase triglycerides, total cholesterol, LDL cholesterol and VLDL cholesterol.¹⁹ The study clearly shows increase in the levels of lipid component in patients with diuretic therapy, though diuretics are important drugs in hypertension treatment, still the clinician should advice the patient with long term hypertension for physical activity. A primary care doctor should give brief advice to most patients about benefits of exercise and refer patients with chronic disease to rehabilitation program that includes exercise intervention.²⁰ Exercise interventions should therefore be considered as a viable alternative to or alongside drug therapy.²¹

Conclusion

Knowledge of effect of diuretics on lipid metabolism is important as diuretics are commonly used drugs for treatment of hypertension and in various

other cardio vascular and renal diseases. It is pertinent that all those who deal with patients with cardiovascular and renal ailments that is Cardiologist, Nephrologist, Physicians, Respiratory therapist and Cardio vascular physiotherapist should have in depth knowledge of effect of diuretics on lipid metabolism. Beside knowledge of effect of diuretics on lipid metabolism the clinician should also advice the patients on diuretic therapy to include some kind of physical activity to keep lipid profile within limits they should be advised for aerobic exercise by means of walking, jogging, cycling, swimming etc or should seek advice from physiotherapist for right kind of exercises with respect to their age, heart rate, blood pressure parameters, within their specific exercise heart zone.

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