

AUDIT OF LIPID PROFILE IN CASES OF HYPERTENSION PRESENTING AT  
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## ABSTRACT

**Objective:** To study lipid profile in cases of hypertension presenting at Nishtar Hospital Multan. **Material and Methods:** This descriptive study was conducted at the Department of Medicine Nishtar Hospital Multan. From April 2018 to October 2018. A total of 100 patients admitted with hypertension were the participants of the study. The patients are in the range of 40-80 years. Both known hypertensive patients on treatment for a varying period and newly diagnosed hypertensive patients were included in the study. **Results:** Serum T.C., TGL, VLDL, LDL, TC/ HDL, LDL/ HDL were significantly elevated in the hypertensive group compared to healthy controls. Serum HDL was low in patients with hypertension as was compared with controls, which was statistically significant. The LDL was raised in obese compared to nonobese patients, which is statistically very significant. TC/ HDL and LDL/ HDL were also raised in obese patients, which is statistically significant. T.C. is raised in the CVA group, which is statistically highly significant. LDL is raised in the CVA group, which is statistically very significant. TC/ HDL and LDL/ HDL are raised in the CVA group compared to the non-CVA group, which is statistically significant. T.C. is raised in the IHD group, which is statistically significant. LDL is raised in the IHD group, which is statistically very significant. LDL/HDL is raised in men, which is statically significant. **Conclusion:** There is a significant alteration of lipid profile in hypertensive patients as compared to controls. Total cholesterol, LDL cholesterol, triglycerides, VLDL, TC/HDL, and LDL/HDL ratios are significantly elevated in patients with hypertension. HDL is significantly reduced in hypertensive patients. Hyperlipidemia is seen in most hypertension cases, with the Type IIa pattern being the most frequent. Mean T.C., LDL, TC /HDL, LDL/ HDL were higher in obese. Mean T.C., LDL, TC/ HDL, and LDL/ HDL ratios are raised in the CVA group. Mean T.C. and LDL are raised in the IHD group.

**KEYWORDS:** Hypertension; T.C.; LDL; HDL; VLDL; TGL; Cerebrovascular accident; Ischemic heart diseases; Obesity.

## INTRODUCTION

The proportion of elderly individuals is on the rise, and hypertension is prevalent in this age group.<sup>[1]</sup> Also, cardiovascular and cerebrovascular diseases associated with elevated blood pressure are more remarkable in older people. 52.2% of deaths due to CAD occur below the age of 70 years in India. There is a raise of coronary artery disease from 3.5% to 11% twenty years in the urban population, which seems to rise substantially in the future.<sup>[2]</sup> Hypertension and lipid profile abnormalities often co-exist. Several well-conducted epidemiological studies have demonstrated that cholesterol levels are significantly higher in hypertensive patients than in age, sex, and body mass index-matched normotensive patient.<sup>[3]</sup> Recent investigations have demonstrated that atherosclerosis and left ventricular hypertrophy are major factors linking hypertension and leading to myocardial infarction. Mechanical stress, endothelial dysfunction, insulin resistance, and genetic factors contribute to this

association as common risk factors linking hypertension and myocardial infarction.<sup>[4-6]</sup> Mildly hypertensive and hyperinsulinemic patients appear to have a faster fractional catabolic rate of apo A1-HDL and lower HDL-cholesterol concentration. These changes appear to result from hyperinsulinemia rather than hypertension itself, as they probably do in patients with non-insulin-dependent diabetes mellitus and hypertriglyceridemia.<sup>[7]</sup> Biological interrelationship between hypertension and hypercholesterolemia may influence the mechanism whereby blood pressure is associated with coronary heart disease. The two risk factors appear to have a synergistic relationship.<sup>[8]</sup> So the early detection of risk factors before the catastrophic and life-threatening effect of severe atherosclerosis is a significant problem for the general public and the practicing physician.

## MATERIAL AND METHODS

This descriptive study was conducted at the Department of Medicine Nishtar Hospital Multan, from April 2018 to October 2018. A total of 100 patients admitted with hypertension were the participants of the study. The patients are in the range of 40-80 years. Both known hypertensive patients on treatment for a varying time and newly diagnosed hypertensive patients were included.

### Inclusion criteria

The inclusion criteria for selecting cases for the present study were as follows: - Patients with essential hypertension with or without the complication of hypertension and medication were included. Systolic blood pressure > 140 mm Hg and diastolic >90 mmHg based on an average of two readings or one in case of known hypertensive and on antihypertensive medication.

### Exclusion criteria

- (1) Secondary hypertensive subjects were excluded from the study.
- (2) Patients with an acute illness like high-grade fever and the first two weeks following surgery were excluded from the study. The purpose of elimination was to obtain a pure picture of the relationship between hypertension and serum lipids.
- (3) Patients with diabetes mellitus, hypothyroidism, and those receiving lipid-altering drugs were excluded.

Control study: -Control group consisted of 50 subjects. After selecting cases for the study, each patient was subjected to the following as per format.

A detailed history

Careful physical examination

Laboratory investigations

Complete blood count

Urine - albumin, sugar, microscopy

Fasting blood sugar, post-prandial blood sugar

ECG

Lipid profile – total cholesterol, HDL cholesterol, LDL cholesterol, VLDL,

Triglycerides

ECHO / cardiac isoenzymes (CPK, SGOT, LDH)/ chest X-ray were done in relevant cases. The blood samplings were drawn from all the patients after a minimum of 12 hours of complete fasting. The patients were asked to have a light fat free diet on the day before the sampling.

All the collected blood samples were sent to the laboratory for lipid profile analysis.

All the collected data were entered into SPSS version 18. Mean and S.D. was calculated for numerical data, and frequencies were calculated for categorical data.

## RESULTS

A total of 100 patients suffering from essential hypertension and 50 healthy controls were studied. The results of various clinical and biochemical parameters and their interrelation are as follows.

Table – 1 shows the age and sex distribution of subjects studied. A total number of 100 cases were studied. Among them, 86 were males, and 14 were females. The youngest patient in the study was 46 years old, and the oldest was 76 years.

Table - 2 shows a definite increase in total cholesterol (mean 194.0) compared to 155.6 among healthy, which is highly significant.

The triglyceride level in hypertensive subjects was 163.6 compared to 125.5 among healthy controls, highly significant.

A mean HDL level of 39.78 is noted in hypertensive compared to 54.5 among healthy controls, which is highly significant. There is a significant increase in LDL level (mean 12.0) compared to 76.1 among healthy controls, which is statistically significant. VLDL values of 32.7 are noted in hypertensive subjects compared to 25.3 among healthy, which is highly significant.

The ratio of TC /HDL shows a definite increase with a mean of 4.96 in hypertensive subjects compared to 2.8 in healthy controls, which is highly significant.

The LDL / HDL ratio shows a definite increase with a mean of 3.10 in hypertensive subjects compared to 1.4 in healthy control, which is highly significant.

Table - 3 shows the mean values with standard deviations of the various lipid fractions of obese and nonobese hypertensive patients. Mean T.C., LDL, TC /HDL, LDL/ HDL were higher in obese. The LDL was raised in obese compared to nonobese patients, which is statistically very significant. TC/ HDL and LDL /HDL were also raised in obese patients compared to nonobese, statistically significant.

Table - 4 shows the mean values of lipid fractions of CVA with hypertension and non-CVA with hypertension. It can be seen that T.C. is raised in the CVA group, which is statistically highly significant. LDL is raised in the CVA group, which is statistically very significant. TC/ HDL and LDL/ HDL are raised in the CVA group compared to the non-CVA group, which is statistically significant. TGL, HDL, and VLDL are not statistically significant.

Table – 5 shows the mean values of lipid fractions IHD patients and non –IHD patients. It can be seen that T.C. is raised in the IHD group, which is statistically significant. LDL is raised in the IHD group, which is

statistically very significant. TGL, H.D., VLDL, TC / HDL, and LDL / HDL are not statistically significant.

Table – 6 shows the lipid level comparison between men and women. It shows that LDL/HDL is raised in men, which is statistically significant, while others were not.

**Table – 1:**

| Age and sex wise distribution of hypertensive patients | Age group    | Male | Female | Total |
|--|--------------|------|--------|-------|
|  | 40-49        | 20   | 3      | 23    |
|  | 50-59        | 25   | 5      | 30    |
|  | 60-69        | 36   | 6      | 42    |
|  | 70+          | 5    | 0      | 5     |
|  | <b>Total</b> | 86   | 14     | 100   |

**Table 2: Comparison of lipid levels between hypertensive patients and healthy controls.**

| (Mean ± S.D) Subjects | No. of cases | TC            | TGL          | HDL          | LDL          | VLDL        | TC/ HDL     | LDL/ HDL    |
|-----------------------|--------------|---------------|--------------|--------------|--------------|-------------|-------------|-------------|
| Hypertension          | 100          | 194.0 ± 39.49 | 163.6 ± 60.8 | 39.78 ± 6.37 | 121.0 ± 41.2 | 32.7 ± 12.2 | 4.96 ± 1.31 | 3.10 ± 1.25 |
| Healthy               | 50           | 155.6 ± 15.4  | 125.5 ± 22.7 | 54.5 ± 4.2   | 76.1 ± 11.4  | 25.3 ± 4.5  | 2.8 ± 0.2   | 1.4 ± 0.2   |
| Significance          |              | p<0.0001      | p<0.0001     | p<0.0001     | p<0.0001     | p<0.0001    | p<0.0001    | p<0.0001    |

**Table 3: Comparison of lipid levels between obese and non-obese hypertensive patients.**

| (Mean ± S.D) Subjects | No. of cases | TC         | TGL          | HDL         | LDL          | VLDL        | TC / HDL    | LDL / HDL   |
|-----------------------|--------------|------------|--------------|-------------|--------------|-------------|-------------|-------------|
| Obese                 | 25           | 205 ± 41.4 | 163.0 ± 49.3 | 40.1 ± 7.01 | 141.0 ± 43.0 | 32.7 ± 9.85 | 5.49 ± 1.43 | 3.55 ± 1.55 |
| Non-obese             | 75           | 187 ± 38.8 | 164.0 ± 64.8 | 39.7 ± 6.23 | 114.0 ± 38.6 | 32.7 ± 13   | 4.79 ± 1.23 | 2.95 ± 1.11 |
| Significance          |              | NS         | NS           | NS          | P<0.01       | NS          | P<0.05      | P<0.05      |

**Table 4: Comparison of lipid levels between CVA and non-CVA patients with hypertension.**

| (Mean ± S.D) Subjects | No. of cases | TC           | TGL          | HDL         | LDL          | VLDL        | TC / HDL    | LDL / HDL   |
|-----------------------|--------------|--------------|--------------|-------------|--------------|-------------|-------------|-------------|
| CVA                   | 15           | 227.0 ± 25.7 | 181.0 ± 71.9 | 38.8 ± 5.13 | 152.0 ± 28.8 | 36.2 ± 14.1 | 5.91 ± 0.95 | 3.93 ± 0.89 |
| Non-CVA               | 85           | 188.0 ± 38.9 | 161.0 ± 58.9 | 40.0 ± 6.61 | 115.0 ± 40.7 | 32.1 ± 11.8 | 4.80 ± 1.30 | 2.96 ± 1.26 |
| Significance          |              | p<0.001      | NS           | NS          | p<0.01       | NS          | p<0.01      | p<0.01      |

**Table 5: Comparison of lipid levels between IHD and non-IHD patients with hypertension.**

| (Mean ± S.D) Subjects | No. of cases | TC         | TGL        | HDL         | LDL        | VLDL        | TC / HDL    | LDL / HDL   |
|-----------------------|--------------|------------|------------|-------------|------------|-------------|-------------|-------------|
| IHD                   | 29           | 209 ± 36   | 161 ± 50.2 | 40.8 ± 6.3  | 146 ± 65.5 | 32.1 ± 10.0 | 5.22 ± 1.17 | 3.32 ± 1.30 |
| Non-IHD               | 71           | 188 ± 39.7 | 165 ± 65.3 | 39.4 ± 6.45 | 115 ± 39.6 | 33.0 ± 13.1 | 4.86 ± 1.36 | 3.01 ± 1.23 |
| Significance          |              | p<0.05     | NS         | NS          | p<0.01     | NS          | NS          | NS          |

**Table 6: Comparison of lipid levels between Men and Women hypertensive patients.**

| (Mean ± S.D) Subjects | No. of cases | TC             | TGL           | HDL         | LDL            | VLDL         | TC / HDL    | LDL / HDL   |
|-----------------------|--------------|----------------|---------------|-------------|----------------|--------------|-------------|-------------|
| Men                   | 86           | 195 ± 43.3     | 160.0 ± 63.2  | 39.4 ± 6.5  | 124.0 ± 43.6   | 32.0 ± 12.6  | 5.06 ± 1.37 | 3.20 ± 1.32 |
| Women                 | 14           | 184.14 ± 13.78 | 186.71 ± 40.8 | 42.0 ± 5.49 | 104.07 ± 12.48 | 37.35 ± 8.17 | 4.37 ± 0.6  | 2.44 ± 0.47 |
| Significance          |              | NS             | NS            | NS          | NS             | NS           | NS          | p<0.05      |

## DISCUSSION

Hypertension and hyperlipidemia are recognized as significant risk factors in CHD development, as evidenced by several epidemiologic studies throughout the world.<sup>[11]</sup> According to these concepts, atherosclerotic plaque development begins when low-density lipoprotein migrates from the bloodstream through the arterial endothelium into the arterial wall. Here it is picked up by receptor sites and taken into smooth muscle cells from the media. The atherosclerotic process starts when these cells migrate into the intima, proliferate, and ultimately break down into atherosclerotic plaque. Hypertension in this scheme plays its role by damaging the endothelial lining of the artery and facilitating the passage of LDL, particularly at arterial bifurcation sites where stress and shear are maximal.<sup>10</sup> The Framingham study revealed that HDL-C level was a major potent lipid risk factor having an inverse association with CHD incidence both in men and women; the proposed hypothesis that HDL facilitates the uptake of cholesterol from peripheral tissue and helps in its transport to the liver for degradation and excretion. However, lower HDL levels, higher LDL levels, and TC/HDL ratio are more predictive of coronary heart disease.<sup>[11]</sup>

In the present study, 100 patients with essential hypertension and 50 healthy control subjects were included. According to JNC VII, hypertension was defined as a systolic blood pressure of  $\geq 140$  mmHg and diastolic blood pressure of  $\geq 90$  mmHg. Blood samples were drawn for lipid profile analysis from all the patients. Lipid profile values were analyzed with various clinical parameters, as discussed below.

In the present study, the group age range was 46-76 years, and the mean age was 59.6 years. A higher number of hypertension patients were seen between the age group 50-69 years, contributing to 72 % of the cases studied. 29.1% of men and 35.7 % of women aged 50-59 years and 41.8 % of men and 42.8 % of women are in the age group of 60-69 years. In the present study, there were 86 males and 14 females. The present study was compared with PROCAM trial data analysis, which showed that hypertension's prevalence strongly increases with age in both sexes.

Ashman G and Schulte H (1987) in his study showed that more than 10% of men and less than 5% of women under 30 years of age were hypertensive and 27% of both men and women aged 40-49 years and 43% of women and 37% of men aged 50-59 years were hypertensive.<sup>[12]</sup> The present study has shown that all the lipid fractions T.C., TGL, LDL-C, VLDL, TC/HDL-C & LDL/HDL-C ratio were higher in the hypertensive than those in the healthy controls, which is under most of the previous reports by various workers. In the present study, all the lipid fractions were elevated except HDL-C, which was reduced. The change in T.C., TGL, HDL-C, LDL-C, VLDL-C, 60 TC/HDL-C, and LDL-C/HDL-C

were statistically significantly higher in hypertensive subjects compared to healthy controls. Castelli W. P, Anderson K.A (1986) had supported that blood pressure and serum cholesterol are correlated with an 'r' factor of 0.12, suggesting that those with higher blood pressure values tend to have higher serum cholesterol in Framingham heart study. Coronary heart disease developed with remarkable consistency in patients with a total cholesterol ratio to HDL-C of more than 4.5. Half of the women and more than half of the men presented with hypertension were already having abnormal lipid profile.<sup>[13]</sup>

Bonn K.H, Thule D.S. (1991) had supported that in both sexes, the total and non-HDL-C level increased significantly with increasing systolic or diastolic blood pressure. The association between blood pressure and total cholesterol level increased with age in women but decreased with age. Smoking, physical activity, and alcohol consumption had little influence on blood pressure and serum lipids.<sup>[14]</sup> IN THEIR STUDY, Chen Y-DI et al. (1991) found that mildly hypertensive patients appear to have a faster catabolic rate of Apo-A1/HDL and lower HDL-C concentration.<sup>[15]</sup>

In the present study, mean T.C., LDL, TC /HDL, LDL/HDL were higher in obese. The LDL was raised in obese compared to nonobese patients, which is statistically very significant. TC/ HDL and LDL /HDL were also raised in obese patients compared to nonobese, which is statistically significant ( $P < 0.05$ ). Raj Lakshman M. et al. (1996) found that plasma triglycerides increased progressively with increasing obesity, whereas HDL decreased with increasing obesity.<sup>[16]</sup>

Bonna K.H (1991), in the Tromso study, showed that when compared to lean subjects, overweight subjects had a more significant increase in the total cholesterol and triglyceride level with an increase in blood pressure.<sup>[14]</sup>

In the present study, it can be seen that T.C. was raised in the CVA group, which is statistically highly significant. LDL was raised in the CVA group, which is statistically very significant. TC/ HDL and LDL/ HDL were raised in the CVA group compared to the non-CVA group, which is statistically significant. TGL, HDL, and VLDL are not statistically significant. This study is compared with the study done by Rajwade.N A. et al. (1996), the levels of total cholesterol, LDL-C lipoprotein, and triglyceride. The strokes patients were observed to have higher levels but not significantly than those of matched normal subjects.<sup>[17]</sup> In the present study, LDL/HDL is raised in men, which is statically significant while others are not. T.C., LDL-C, TC/HDL are raised in men compared to women, statistically not significant. TGL. HDL-C and VLDL were raised in women compared to men, which is statistically not significant. Castelli W. P (1986) stated that triglycerides were a powerful predictor of CHD in women over 50, whereas no relationship was seen in men in univariate analysis. On multivariate analysis,



triglycerides are a statistically significant risk factor in women.<sup>[13]</sup> Karpanov E. et al. (1992) concluded that serum lipid and Apo variation during the menstrual cycle differ significantly between hypertensive and normotensive women. He states that this should be taken under consideration in patients' overall treatment with the added risk of hypertension.<sup>[18]</sup>

## INTERPRETATION AND CONCLUSION

There is a significant alteration of lipid profile in hypertensive patients as compared to controls. Total cholesterol, LDL cholesterol, triglycerides, VLDL, TC/HDL, and LDL/HDL ratios are significantly elevated in patients with hypertension. HDL is significantly reduced in hypertensive patients. Hyperlipidemia is seen in most hypertension cases, with the Type IIa pattern being the most frequent. Mean T.C., LDL, TC /HDL, LDL/ HDL were higher in obese. Mean T.C., LDL, TC/ HDL, and LDL/ HDL ratios are raised in the CVA group. Mean T.C. and LDL are raised in the IHD group.

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