

# PATTERN OF SERUM HIGH DENSITY LIPOPROTEIN (HDL) & LOW DENSITY LIPOPROTEIN (LDL) LEVEL IN HYPERTENSIVE PATIENT

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## Abstract

**Background:** Hypertension and dyslipidemia are major risk factors for cardiovascular disease, accounting for the highest morbidity and mortality among the Bangladeshi population. The aim of our study is to determine the pattern of serum Low Density and High Density Lipoprotein level in hypertensive patient.

**Methods:** This observational cross sectional study was carried out among 100 patient admitted in Department of Medicine in Dhaka Medical College Hospital. Patients were enrolled consecutively and informed written consent was obtained. Detailed information were recorded in questionnaire approved by the ethical review committee of Dhaka Medical College.

**Results:** Among 100 cases, the mean age was found 48.76±7.11 years in hypertensive group and 38.39±8.41 years in normotensive group. Mean total cholesterol was found 239.43±22.17 mg/dl in hypertensive group and 189.21±14.26 mg/dl in normotensive group. Mean triglyceride was 178.34±10.94 mg/dl in hypertensive group and 142.48±12.83 mg/dl in normotensive group. Mean HDL-cholesterol was 39.24±5.07 mg/dl and 44.28±7.82 mg/dl in hypertensive and normotensive group respectively. Mean LDL-cholesterol was 154.78±13.55 mg/dl in hypertensive group and 116.72±12.33 mg/dl in normotensive group. Binary logistic regression analysis showed high Total Cholesterol was significantly associated with hypertensive patients and the odds ratio (OR) was 1.21, 95% CI 0.97–1.67, P<0.001. High Triglyceride and Low density lipoprotein significantly associated with hypertensive patients (OR 1.28, 95% CI 0.91–1.38, P<0.001 and OR 1.07, 95% CI 0.96–1.56, P<0.003, respectively). Low High density lipoprotein was also associated with hypertensive patients (OR 1.22, 95% CI 0.89–1.69, P<0.001).

**Conclusion:** Mean total cholesterol, triglyceride; LDL-cholesterol was significantly higher in hypertensive group in comparison to normotensive group. Where as mean HDL-cholesterol was significantly lower in hypertensive group in comparison to normotensive group. High total cholesterol, high triglyceride, low density lipoprotein and low high density lipoprotein were significantly associated with hypertensive patients.

**Keywords:** HDL, LDL, Lipid profiles, Hypertension.

DOI: <https://doi.org/10.3329/jdmc.v30i1.56907>  
J Dhaka Med Coll. 2021; 29(1) : 82-86

## Introduction:

Various epidemiological studies revealed that there is a positive correlation between serum cholesterol and blood pressure (BP); hypertensive patients commonly showed elevated cholesterol levels than normotensive

subjects. Prior observational studies have suggested a graded, inverse relationship between HDL cholesterol and both cardiovascular disease and total mortality.<sup>1</sup>

Abnormalities in serum lipids and lipoprotein levels with essential hypertension are vital

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**Received:** 31-12-2020

**Revision:** 26-01-2021

**Accepted:** 02-02-2021

independent causal factors for atherosclerotic cardiovascular disease (ASCVD). The coexistence of these factors has a synergistic effect in heightening the risk of cardiovascular events.<sup>2</sup>

It has been well known that hypertension is an independent risk factor of cardiovascular disease, development of cognitive decline<sup>3</sup>, and Alzheimer's disease.<sup>4</sup> Dyslipidemia measures including high total cholesterol (TC) and low high-density lipoproteins-cholesterol (HDL-C) are also independent risk factors of cardiovascular disease and cerebrovascular disease.<sup>5</sup> However, there has been no correlation analysis between change in blood pressure and HDL-C in general population. Hypertension in midlife is also a strong and independent risk factor of Alzheimer's disease and vascular dementia in late-life.<sup>6</sup> because individuals who develop hypertension earlier in life are likely to be exposed to the deleterious neurological effects of hypertension for many decades.

Dyslipidemia measures including high total cholesterol (TC) and low high-density lipoproteins-cholesterol (HDL-C) are also independent risk factors of cardiovascular disease and cerebrovascular disease. However, there has been no correlation analysis between change in blood pressure and HDL-C in general population.<sup>7</sup>

Hypertension is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease deaths in India.<sup>8</sup> For countries which are in the second stage of development, infectious disease burdens are reduced and diseases related to hypertension, such as hemorrhagic stroke and hypertensive heart disease, become more common. For example, in the seven countries study, low CHD rates were observed in Japan and the Mediterranean countries, and high CHD rates in Finland and the US. These differences were in large part explained by differences in diet, serum cholesterol and blood pressure.<sup>9</sup> High blood pressure is a trait as oppose to a specific disorder and represents a quantitative rather than a qualitative deviation from normal. Any definition of hypertension is therefore arbitrary.

Hypertension is one of the most common complex genetic disorders, with genetic heritability averaging 30%. Like other multifactorial human traits, it is caused by the interplay of several different 'risk' genes and multiple environmental factors. The threshold model of multifactorial inheritance predicts that those with an inherited genetic liability above a certain threshold will develop hypertension, especially when exposed to aggravating environmental stimuli.<sup>10,11</sup>

#### **Methods:**

The study was designed as an observational cross-sectional study among 100 patients who was admitted in the Department of Medicine in Dhaka Medical College Hospital with hypertension and normal blood pressure. Under the JNC-8 scheme, considered degrees of hypertension; In case of age 18-59: Systolic Blood Pressure >140 mmHg or Diastolic Blood Pressure >90 mmHg, in case of age 60 and above: Systolic Blood Pressure >150 mmHg or Diastolic Blood Pressure >90 mmHg, or current treatment with antihypertensive medication.

The patients were interviewed face to face for the purpose of collection of data. Then the patients were examined for certain signs and those would be recorded in the questionnaire. Information was collected who give consent and participate in the study willingly. Statistical analyses were carried out by using the Statistical Package for Social Sciences version 23.0 for Windows (SPSS Inc., Chicago, Illinois, USA). The mean values were calculated for continuous variables. The quantitative observations were indicated by frequencies and percentages. Student t-test was used for continuous variables. P values <0.05 was considered as statistically significant.

#### **Ethical consideration:**

Ethical clearance for the study was taken from the Institutional ReviewBoard of DMCH prior to commencement of this study.

#### **Results:**

We evaluated 100 patients (50 hypertensive, 50 normotensive). Age, body weight, height, BMI, systolic and diastolic blood pressure, fasting lipid profile of all the participants was analyzed.

BMI circumference was calculated according to Western Pacific Region Office of WHO.

Table 1 shows that mean age, height, weight, BMI were not statistically significant ( $p > 0.05$ ) between two groups, but mean systolic and diastolic blood pressure were significantly higher in hypertensive group than normotensive group.

Table 2 shows that mean total cholesterol was found  $239.43 \pm 22.17$  mg/dl in hypertensive group and  $189.21 \pm 14.26$  mg/dl in normotensive group. Mean triglyceride was  $178.34 \pm 10.94$  mg/dl in hypertensive group and  $142.48 \pm 12.83$  mg/dl in normotensive group. Mean HDL-

cholesterol was  $39.24 \pm 5.07$  mg/dl and  $44.28 \pm 7.82$  mg/dl in hypertensive and normotensive group respectively. Mean LDL-cholesterol was  $154.78 \pm 13.55$  mg/dl in hypertensive group and  $116.72 \pm 12.33$  mg/dl in normotensive group. Table 3 Binary logistic regression analysis showed TC was significantly associated with hypertensive patients and the odds ratio (OR) was 1.21, 95% CI 0.97–1.67,  $P < 0.001$ . TG and LDL were significantly associated with hypertensive patients (OR 1.28, 95% CI 0.91–1.38,  $P < 0.001$  and OR 1.07, 95% CI 0.96–1.56,  $P < 0.003$ , respectively). HDL was also associated with hypertensive patients (OR 1.22, 95% CI 0.89–1.69,  $P < 0.001$ ).

**Table-I**  
*Baseline characteristics of the study subjects (n=100)*

Indicators	Hypertensive (n=50) Mean(±SD)	Normotensive (n=50) Mean(±SD)	p value
Age (years)	48.76(±7.11)	48.76(±7.11)	>0.99
Height (Meter)	1.55 (±0.21)	1.55(±0.21)	>0.99
Weight (Kg)	63.72(±2.97)	63.72(±1.79)	>0.99
BMI (kg/m <sup>2</sup> )	25.87(±2.14)	25.87(±1.51)	>0.99
Systolic BP (mmHg)	146.77(±10.84)	119.81(±5.4)	0.001
Diastolic BP (mmHg)	102.72(±7.72)	82.79(±5.86)	0.001

P value reached from unpaired t-test Data is expressed as Mean ±SD. S- Standard deviation.

**Table-II**  
*Serum lipid profiles of the study subjects (n=100)*

Lipid profiles	Hypertensive(n=50) Mean(±SD)	Normotensive(n=50) Mean(±SD)	P value
Total cholesterol (mg/dl)	239.43(±22.17)	189.21(±14.26)	0.001
Triglyceride (mg/dl)	178.34(±10.94)	142.48(±12.83)	0.001
HDL-cholesterol (mg/dl)	39.24(±5.07)	44.28(±7.82)	0.001
LDL-cholesterol (mg/dl)	154.78(±13.55)	116.72(±12.33)	0.001

p value reached from unpaired t-test

**Table-III**  
*Binary logistic results for hypertensive and normotensive patients*

	Odds ratio	Confidence interval (CI)	P value
Total cholesterol (<200 mg/dl)	1.21	0.97-1.67	0.001
Triglyceride (<150 mg/dl)	1.28	0.91-1.38	0.001
HDL-cholesterol (<40 mg/dl)	1.07	0.96-1.56	0.003
LDL-cholesterol (<100 mg/dl)	1.22	0.89-1.69	0.001

**Discussion:**

Hypertension is recognized globally as a major public health problem. It is a well-known risk factor for coronary artery disease, type 2 diabetes mellitus and renal diseases. About 80% of hypertensive persons have co-morbidities such as obesity, glucose intolerance, low HDL-cholesterol, high LDL-cholesterol and increased triglycerides etc.

In this present study it was observed that mean age, height, weight, BMI were not statistically significant ( $p>0.05$ ) between two groups. Sharmin et al.<sup>12</sup> found mean age was not statistically significant ( $p>0.05$ ) between two groups. Sharmin et al.<sup>12</sup> also found mean BMI  $24.91\pm 1.23$  kg/m<sup>2</sup> in hypertensive group and  $24.43\pm 1.53$  kg/m<sup>2</sup> in healthy controls group, which was not statistically significant ( $P>0.05$ ) between two groups.

In this study it was observed that mean systolic blood pressure was  $145.7\pm 10.84$  mmHg in hypertensive group and  $119.81\pm 5.4$  mmHg in normotensive group. Mean diastolic blood pressure was  $102.72\pm 7.72$  mmHg and  $82.79\pm 5.86$  mmHg in hypertensive and normotensive group respectively. Mean systolic blood pressure and diastolic blood pressure were significantly higher in hypertensive group than normotensive group. In a study by Forhad et al.<sup>13</sup> found mean systolic blood pressure (SBP) of hypertensive and normotensive were  $146.77\pm 8.84$  vs  $119.21\pm 1.4$  mm of Hg and mean diastolic blood pressure (DBP) was  $98.92\pm 7.2$  vs  $84.89\pm 8.6$  mm of Hg respectively. The mean of SBP and DBP of hypertensive was found to be higher than normotensive ( $p<0.001$ ).

In this current study it was observed that mean total cholesterol  $239.43\pm 22.17$  mg/dl in hypertensive group and  $189.21\pm 14.26$  mg/dl in normotensive group. Mean triglyceride was  $178.34\pm 10.94$  mg/dl in hypertensive group and  $142.48\pm 12.83$  mg/dl in normotensive group. Mean HDL-cholesterol was  $39.24\pm 5.07$  mg/dl and  $44.28\pm 7.82$  mg/dl in hypertensive and normotensive group respectively. Mean LDL-cholesterol was  $154.78\pm 13.55$  mg/dl in hypertensive group and  $116.72\pm 12.33$  mg/dl in normotensive group. In Forhad et al.<sup>13</sup> study the results revealed that the mean value of

serum total cholesterol, triglycerides and serum LDL-cholesterol was significantly higher and statistically significant. The mean of HDL of cases were lower than that of controls and was statistically significant. A prospective study which was based in the northern region of Bangladesh, to investigate the lipid profile status in hypertensive patients as compared to healthy normotensive controls. Their study revealed similar findings of high serum total cholesterol, triglycerides and LDL-cholesterol as observed in our study.<sup>14</sup> Our findings of increased level of total cholesterol in hypertensive patients are similar to the findings of some other study.<sup>15</sup> A prospective study conducted in Bangladesh on type 2 diabetes mellitus patients with and without hypertension revealed significantly high total cholesterol, triglycerides and LDL-cholesterol in hypertensive patients with type 2 diabetes mellitus as compared to the normotensive type 2 diabetes mellitus subjects.<sup>16</sup> Few studies showed strong association of hypertension and dyslipidemia with major risk factors of coronary heart disease.<sup>17</sup>

In this study regression analysis showed TC was significantly associated with hypertensive patients and the odds ratio (OR) was 1.21, 95% CI 0.97–1.67,  $P<0.001$ . TG and LDL were significantly associated with hypertensive patients (OR 1.28, 95% CI 0.91–1.38,  $P<0.001$  and OR 1.07, 95% CI 0.96–1.56,  $P<0.003$ , respectively). HDL was also associated with hypertensive patients (OR 1.22, 95% CI 0.89–1.69,  $P<0.001$ ). Choudhury et al.<sup>18</sup> showed binary logistic regression analysis TC was significantly associated with hypertensive patients and the odds ratio (OR) was 1.1, 95% CI 0.91–1.77,  $P<0.002$ . TG and LDL were significantly associated with hypertensive patients (OR 1.1, 95% CI 0.49–1.44,  $P<0.05$  and OR 1.2, 95% CI 0.69–1.66,  $P<0.001$ , respectively). HDL was also associated with hypertensive patients (OR 1.08, 95% CI 0.77–1.52,  $P<0.05$ ). DBP showed significant association with hypertensive patients (OR 1.7, 95% CI 0.33–3.29,  $P<0.05$ ). In another study Forhad et al.<sup>13</sup> showed binary logistic regression analysis showed total cholesterol was significantly associated with hypertensive

patients Odds Ratio (OR) 1.20; 95% CI (0.97-1.38),  $p < 0.001$ . Triglyceride and LDL-C was significantly associated with hypertensive patients (OR 1.29; 95% CI 0.91-1.41,  $p < 0.001$ ) and (OR 1.22; 95% CI 0.89-1.31,  $p < 0.001$ ) respectively. HDLC was also associated with hypertensive patients (OR 1.08; 95% CI (0.96-1.28),  $p < 0.001$ ).

### Conclusion:

Total Cholesterol, LDL Cholesterol, Triglyceride was significantly higher in hypertensive patients and their level correlates with the level of hypertension. The HDL cholesterol level was lower in all hypertensive patients compared to non-hypertensive.

### Acknowledgments

We acknowledge our heartiest gratitude Department of Medicine, Dhaka Medical College Hospital and acknowledgements would remain incomplete if I do not offer my special gratitude to the patients and their parents whose wholehearted co-operation has enabled me to carry out this study successfully.

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