# ASSOCIATION OF LIPID PROFILE AND BODY MASS INDEX (BMI) IN HYPERTENSIVE PATIENTS OF EASTERN NEPAL

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## ABSTRACT

**Dyslipidemia is closely associated with hypertension. Out of different fractions of lipoprotein, definite association of elevated LDL-Cholesterol (LDLc) and other lipid parameters has been well observed in hypertensive patients. The present cross sectional study was undertaken at BP Koirala Institute of Health Sciences with the aim to find out association of different lipid parameters and Body Mass Index (BMI) among newly diagnosed hypertension without any medications in Eastern Nepal.**

**80 hypertensive patients fulfilling JNC-7 criteria and 80 healthy controls were enrolled in this study. Lipid parameters (TC, TG, LDLc, VLDLc, HDLc) were estimated by Enzymatic Colorimetric test. Quetlet's formula was used to calculate BMI.**

**Results were analyzed with student's 't' test and Pearson correlation analysis. Mean age of patients and controls were 36.30 ± 7.73 yrs & 32.13 ± 7.21 yrs respectively. There was significant increase in different lipid parameters namely TC (170.18 22.53 vs 145.23 21.13,P<0.005), TG (146.60 53.87 vs 119.77 35.61, P<0.005), LDLc (100.71 23.74 vs 79.25 20.10,P<0.05) and VLDLc (29.32 1077 vs 23.92 7.12, P<0.05) in patients as compared to the healthy controls. However there was no any significant difference in HDLc value. Pearson correlation analysis shows positive correlation of BMI with all the four lipid parameters even though it was not statistically significant. Thus this study shows direct association of BMI, dyslipidemia in hypertensive patients of the Eastern Nepal.**

***Key Words: Dyslipidemia, Hypertension Body Mass Index, Hypertension.***

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## INTRODUCTION

Hypertension is the commonest cardiovascular disorder, affecting about 20% of the adult population in many countries throughout the globe[1] and Nepal is no exception. It is one of the major risk factor for cardiovascular and renal dysfunction. World Health Organization (WHO) defines hypertension as Blood Pressure (BP) exceeding 160/95 mmHg.[2] The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation & Treatment of High Blood Pressure (JNC-7) classifies BP as Normal (Systolic BP<120 mmHg and Diastolic BP<80 mmHg), Prehypertension (Systolic BP120-139 mmHg and Diastolic BP 80-89 mmHg), Hypertension stage1 (Systolic BP140-159 mmHg and Diastolic BP 90-99 mmHg) and hypertension stage 2 (Systolic BP  160 mmHg and Diastolic BP 100 mmHg) respectively.[3] The classification is based on the average of two or more properly measured, seated BP reading on each of two or more office visits.

Overweight and obesity, with increasing body mass index (BMI) leads to adverse metabolic effects on blood pressure, cholesterol and triglyceride level. The clinical definition of obesity is usually expressed in terms of body mass index, also called Quetlets index, which is calculated by dividing one's weight (in kg) by the square of one's height (in meters). In 1997, the World Health Organization (WHO) clearly defines the various classifications of obesity and overweight. WHO criteria defines overweight if BMI = 25 kg/m$^2$ and obesity as BMI =30 kg/m.[2,4] BMI greater than 25, clearly confers increased risk for a number of health condition. Obesity and overweight is associated with increased risk of various disorder including dyslipidemia.

Various studies show an association between BMI, dyslipidemia and hypertension. However, genetic, climatic and other regional factors influence these parameters. No such systemic study has been done in the local population of Eastern Nepal. Therefore, a cross sectional study was conceived with the aim of estimating serum lipid profile and BMI in the freshly diagnosed hypertensive patients attending the Medicine out-patients department (OPD) or General OPD of BP Koirala Institute of Health Sciences, Dharan.

## MATERIALS AND METHODS

This study was a cross sectional study in which 80 freshly diagnosed hypertensive patients who were on no antihypertensive medication were enrolled. Age, sex matched 80 healthy controls without hypertension or any other metabolic diseases were enrolled. Informed consent was obtained from all the subjects. Blood pressure was measured by mercury column sphygnomanometer using a standard technique in the sitting posture after the subject had rested for at least 5 minutes. As an anthropometrical measurement, body weight and height were measured. BMI was calculated by dividing the body weight of individual by the square of the heights. 12 to 14 hours fasting blood sample was collected by venipuncture in all the subjects. Serum was separated and lipid parameters (Total Cholesterol (TC), Triacylglycerol (TG), Low density Lipoprotein (LDLc), High density lipoprotein (HDLc) and Very low density lipoprotein (VLDLc) was assayed by enzymatic method.

### *Statistical analysis*

Statistical analyses were performed by using Epi  Info 2000. The results were analyzed by student 't' test, Chi-Square test and Pearson Correlation analysis.

## RESULTS

Profile of the hypertensive patients and healthy individuals is shown in table I. They were matched for age and sex. Table II shows the BMI and serum lipid profiles in patients with hypertension and healthy controls.

Pearson Correlation analysis shows positive correlation of BMI with all the four lipid parameters even though it was not statistically significant. But the Pearson correlation analysis of BMI with weight (r = 0.845), waist circumference (r = 0.548) and hip circumference (r = 0.486) was statistically significant ($p < 0.005$). Correlation of Total cholesterol (TC) with LDLc was very high(r=0.884) and was statistically significant (P<0.0001). Similarly, correlation coefficient of TG with VLDLc was 1.00 which was also statistically significant (P=0.0001).

**Table I: Profiles of patients & controls**

| S.N. | Particulars | Patients (Mean ±SD) | Control (Mean ±SD) |
|---|---|---|---|
| 1 | Age (yrs) | 36.30 ±7.73 | 32.13 ±7.21 |
| 2 | Sex | | |
| | Male | 44 | 45 |
| | Female | 36 | 35 |
| 3 | Height (cm) | 162.05 ±10.14 | 162.04 ±5.89 |
| 4 | Weight (Kg) | 64.12 ±14.65* | 58.03 ±7.91 |

**P<0.05*

**Table II: BMI & Serum lipid profile of hypertensive patients & Control**

| S.N. | Parameters | Patients (n=80) Mean ±SD | Control (n=80) Mean ±SD |
|---|---|---|---|
| 1 | BMI (Kg/m$^2$) | 24.29±4.80* | 22.05 ±2.35 |
| 2 | TC (mg/dl) | 170.18±22.53** | 145.23 ±21.13 |
| 3 | TG (mg/dl) | 144.60 ±53.87** | 119.77 ±35.61 |
| 4 | LDLc (mg/dl) | 100.71 ±23.74* | 79.25 ±20.10 |
| 5 | HDLc (mg/dl) | 40.10 ±4.62 | 42.03 ±3.38 |
| 6 | VLDLc (mg/dl) | 29.32 ±10.77* | 23.95 ±7.12 |

**P<0.05, **P<0.005*

## DISCUSSION

Hypertension is an emerging health problem in South East Asia. Various studies on lipid levels carried out in these regions have shown a mixed picture of dyslipidemia. The present study was undertaken to find out the association of dyslipidemia with hypertension in the Eastern part of Nepal at BPKIHS, which caters the region.

Various studies suggest high BMI as an important risk factor for different cardiac diseases. The Scandinavian Simvastation Survival Studies (SSSS) groups[5] found BMI>22 Kg/m$^2$ to be associated with many risk factors. The mean BMI of the patients in our study group (24.29 4.80 Kg/m$^2$) satisfies the SSSS study group criteria.

Study by Mendes and Ekanayake[6] showed high Total Cholesterol (TC) level in hypertensive patients. AFCAPS/ TexCAPS (Air force/Texas Coronary Arteriosclerosis Preventive Study) Research group[7] study has shown total serum cholesterol> 150 mg/dl as a risk factor for Asian Indians. The TC level in the hypertensive patients involved in our study is also greater than 150 mg/dl. On the contrary the normal serum total cholesterol value given by NCEP guideline[8] is < 200 mg/dL. Although the average total cholesterol was lower than these standard value fixed by NCEP Guidelines, these values were significantly higher than the mean value of the healthy subjects of the local population. Also the serum TC level in the Nepalese population outside the valley has been reported to be 151 ± 42 mg/dl by Nakansihi et al[9] which is little more than our finding (145.23 ± 21.13 mg/dl).

The results obtained in this study are in support that there is a direct association between hypertension and dyslipidemia. The lipid profile parameters showed a positive correlation with the BMI. Statistically no significant difference was seen in the WHR of patients and controls. The finding of our study in the calculated LDLc of the patients is in accordance with the same type of study carried out in countries such as Germany, America and Finland. The sample size was small as it was difficult to find out the freshly diagnosed hypertensive patients who were on no antihypertensive medication and the time duration during which the study was conducted was also small. If carried out on a larger scale some significant observations might

be observed in WHR of patients and controls. Based on the findings in this study, modifications in the lifestyle could be suggested so that BMI and stress could be reduced.

Thus this study suggests a direct association between hypertension, dyslipidemia and body mass index in the population of Eastern Nepal. Based on these findings it can be suggested that the lifestyle should be modified on such a way that BMI and the stress could be reduced.

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