Research Article

STUDY TO ASSESS RELATION OF LIPID PROFILE AND HYPERTENSION IN PATIENTS ATTENDING NIMS HOSPITAL, JAIPUR, RAJASTHAN

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Abstract:

Dyslipidaemia and hypertension are major cardiovascular disease risk factors, and the Indian population experiences the highest rates of morbidity and mortality. The objective of this study was to determine the relation between lipid profiles in hypertensive patients with normotensive control subjects in patients attending NIMS Hospital, Jaipur Rajasthan. A single-Center, case-control hospital based study was carried out among 140 participants (eighty (80) patients were included in the study) from January 2021 to June 2022 in National Institute of Medical Sciences and Research, Jaipur, Rajasthan, India. Data were collected on sociodemographic factors, anthropometric measurements, blood pressure, and lipid profile including total cholesterol (TC), triglyceride (TG), low density lipoprotein (LDL), and high density lipoprotein (HDL). On analysis of the lipid profile of 80 hypertensive patients and 80 Normotensive control subjects the mean TC values in cases and controls are 199 mg/dl and 167 mg/dl respectively. The mean TG values are 199 mg/dl and 123 mg/dl, the mean LDL c values are 121.5 mg/dl and 97.5 mg/dl. The serum levels of TC, TG, and LDL were higher while HDL levels were lower in hypertensive subjects compared to normotensives, which was statistically significant ($P<0.001$). Age, waist circumference, and body mass index showed significant association with hypertensive patients ($P<0.0001$) but not with normotensives. The logistic regression analysis showed that hypertensive patients had higher TC and TG, LDL and lower HDL than normotensives, which was statistically significant ($P<0.05$). Hypertensive patients in NIMS hospital, Jaipur, Rajasthan have a close association with dyslipidaemia and need measurement of blood pressure and lipid profile at regular intervals to prevent cardiovascular disease, stroke, and other comorbidities.

Keywords: Risk Factor, Cardiovascular Disease, Dyslipidaemia, Blood pressure

Introduction:

In low- and middle-income nations, hypertension and dyslipidaemia are major cardiovascular disease (CVD) risk factors, causing more than 80% of deaths and disability. It is anticipated that the prevalence of hypertension will rise worldwide, particularly in developing nations. Diabetes, lipid metabolism disorders, obesity (40 %), hyperuricemia (25 %), metabolic disorders and syndromes (40 %), and a sedentary lifestyle (smoking, excessive alcohol consumption) are the most common risk factors. Age and gender are also important factors, with an increase in systolic and diastolic pressure with age and a decrease in diastolic pressure in the elderly population. Several risk factors, whose mapped contrivance may be essential for prevention, are consistently linked to the disorder's onset. These markable factors fall broadly into the reversible, irreversible, and partially reversible categories. The effects of smoking, hypertension, hypercholesterolemia, obesity and excess weight, oral contraceptives, alcohol consumption, sedentary behaviour, and a lifestyle that is overly stressful are all reversible factors. Family history, gender, and age are the most common irreversible risk factors, while menopause in women and diabetes are partial irreversible risk factors [1-5].

Morbidity and mortality rates are higher in hypertensive patients with CVD. A few clinical examinations uncover that bringing down cholesterol may all the while lower hypertension. In return, the risk of cardiovascular disease quadruples when hypertension and dyslipidaemia are combined. Pathophysiological mechanisms involving endothelial dysfunctions, oxidation, inflammation, altered homeostasis, decreased nitric oxide content, platelet aggregation, and excessive membrane NADPH oxidase activity that has negative effects indicate this relationship [6-8].

According to the NHANES research, diabetes mellitus, hypertension, and dyslipidemia are the three most frequent comorbidities linked with obesity. Atherogenic dyslipidemia is frequent in obesity and considerably raises the probability of CVD. Reduced mRNA levels of lipoprotein lipase (LPL) in adipose tissue and decreased LPL levels in skeletal muscle, along with competition between chylomicrons and very low-density lipoprotein (VLDL) for lipolysis, all reduce the ability of triglyceride-rich lipoproteins to be dissolved in the body's fluids. Limits of Triglycerides and FFAs are raised as a result of increased postprandial lipemia. The triglyceride content of LDL rises in hypertriglyceridemia [9].

The objective of this study was to determine the relation between lipid profiles in hypertensive patients with normotensive control subjects in patients attending NIMS hospital, Jaipur, Rajasthan.

Material and Methods:

Study Design and sample size:

The study was carried out at the department of General Medicine of a tertiary care hospital, National Institute of Medical Sciences and Research, Jaipur, Rajasthan, India. The study was single-Center, case-control hospital based study.

The total duration of the study was 18 months within the time frame of January, 2021 to June, 2022.

Sample size was calculated using 80 cases of Hypertension and 80 control as per seed article having minimum difference of mean 186.41 and 202.46 for 80% power and 0.05 alpha error.

$$n = \frac{(z_{\alpha/2} + z_{\beta/2})^2 (\sigma_1^2 + \sigma_2^2)}{\Delta^2}$$

Study Criteria:

Patients were selected based on the following inclusion and exclusion criteria:

Inclusion Criteria:

- Patients of either gender aged 30 years and above.
- Patients with essential hypertension with or without complication of hypertension and on medication
- Systolic blood pressure >140 mmHg and Diastolic blood pressure >90mmHg based on average of two readings.
- Normotensive patients on antihypertensive medication.
- Patients who were willing to participate in the study by signing the informed consent form.

Exclusion Criteria:

- Patients who were not willing to give written informed consent.
- Secondary hypertensive subjects excluded from the study.
- Patients with acute illness like high grade fever and hypertension after first two week of surgery will be excluded from the study.
- Patients with diabetes mellitus, hypothyroidism & those receiving lipid altering drugs will be excluded.

Study Procedure:

The study participants were explained about the purpose of the study in detail. Informed consent form obtained from them and data collection procedure performed. Socio demographic information of the study participants including age, gender, area of residence, socio-economic status (Kuppuswamy's classification), occupation etc. were collected from them. General Physical Examination and anthropometric measurements like height and weight were measured; blood pressure, heart rate were monitored regularly. In lab investigations, mainly lipid profile *viz.* total cholesterol (TC), high density lipoprotein cholesterol (HDL) levels; low density lipoprotein cholesterol (LDL) levels and triglycerides (TG) were estimated. Study methodology is represented in ***Figure 1***. Those having TC ≥ 200 mg/dl or TG ≥ 150 mg/dl or LDL ≥ 130 mg/dl or HDL< 40 mg/dl for men and < 50 mg/dl for women were considered as dyslipidemic [US National Cholesterol Education Programme Adult Treatment Panel III (NCEP ATP III) guidelines] depicted in ***Table 1***.

Table 1: NCEP ATP III classification of LDL, HDL (mg/dl)

Total Cholesterol	
< 200	Desirable
200-239	Borderline high
≥ 240	High
LDL Cholesterol	
< 100	Optimal
100-129	Near optimal/above optimal
130-159	Borderline high
160-189	High
≥ 190	Very high
HDL Cholesterol	
< 40	Low
≥ 60	High

According to Joint National Committee (JNC 8) guidelines, hypertension is defined as Systolic blood pressure (SBP) ≥ 140mmHg and or Diastolic blood pressure (DBP) ≥ 90mmHg (***Table 2)***.

Table 2: Joint National Committee (JNC 8) guidelines Classification of Blood Pressure in Adults (age ≥ 18 years)

Classification	**Systolic Blood Pressure (mmHg)**	**Diastolic Blood Pressure (mmHg)**
Normal	< 120	< 80
Prehypertension (HTN)	120-139	80-89
Stage 1 HTN	140-159	90-99
Stage 2 HTN	≥ 160	≥ 100

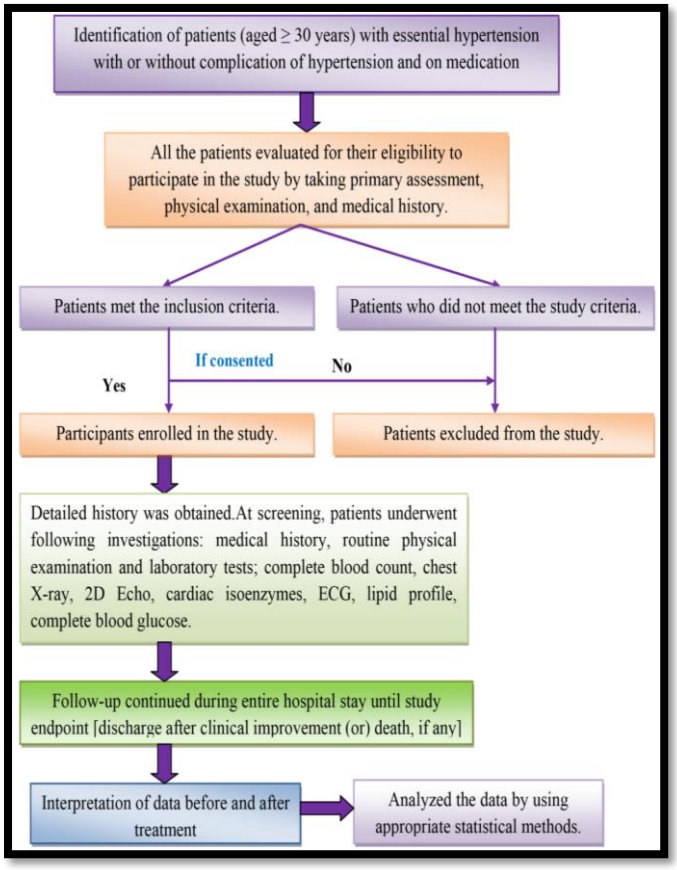

Figure 1: Schematic Diagram of Study Procedure

Statistical analysis:

At first, data entered into M.S. Excel and analysis was done by using statistical package for social sciences SPSS v22 (IBM Corp. Version 22, Chicago, Illinois, USA). Baseline characteristics are presented as frequencies (%) for categorical data. The Chi Square test and unpaired-T Test (Wherever appropriate) used to find the statistical difference between categorical variables among study groups and for continuous variable significant differences between mean & SD was tested by Z test. P value of <0.05 was considered to be significant.

Results:

We screened 140 patients of heart failure who presented at National Institute of Medical Sciences & Research, Jaipur, Rajasthan during the study period. After screening for the inclusion and exclusion criteria, eighty (80) patients were included in the study. Eighty (80) non-hypertensive persons of same age group were included in the study as control. To study the prevalence of dyslipidemia the hypertensive patients were compared with the normotensive group. To study the influence of various parameters on lipid profile, patients from the hypertensive group only were selected. Patients who are positive for the parameters to be tested act as cases and those who are negative act as controls.

With the available data two type of analysis were done.

The mean values of Total cholesterol and other sub-groups of cholesterol were calculated for cases and controls and their differences were analyzed for statistical significance. The statistical analysis is done using unpaired – T test, double tailed with unequal variance.

The percentage of dyslipidemia prevalence for among cases and controls were calculated and compared. The percentage prevalence was analyzed for statistical significance using Chi-square test.

Table 3: Summary of Statistics for Continuous Variables

S.NO	ITEMS	MEAN	MEDIAN	RANGE
1	Age	55.9159	58	30-75
2	Height	157.907	158	138-174
3	Weight	67.4579	65	50-97
4	BMI	27.2507	26.67276	19.8-40.4
5	TC	196.804	191	150-283
6	TG	197.312	180	58-495
7	LDL	119.153	117	64-190
8	HDL	37.935	38	24-53

Table 4: Mean Lipid Values: Cases vs Controls

Lipid		Mean	SD	' p ' Value
TC	Cases (80)	199	2.67	*< 0.0001 Significant*
	Control (80)	167	2.77	
TG	Cases (80)	199	7.03	*< 0.0001 Significant*
	Control (80)	123	5.40	
LDL	Cases (80)	121.5	2.45	*< 0.0001 Significant*
	Control (80)	97.5	2.74	
HDL	Cases (80)	36.8	0.63	*< 0.0001 Significant*
	Control (80)	41.1	0.98	

Table 5: Percentage of Dyslipidemia: Cases vs Controls

Lipid		Percent (%)	' p ' Value
TC	Cases (80)	42.9	*< 0.0001 Significant*
	Control (80)	7	
TG	Cases (80)	82.14	*< 0.0001 Significant*
	Control (80)	20	
LDL	Cases (80)	31.03	*0.0003 Significant*
	Control (80)	6	
HDL	Cases (80)	54.1	*0.005 Significant*
	Control (80)	33	

The total cholesterol, triglycerides, LDL-c and HDL-c are significantly higher in hypertensive patients (cases) when compared with non-hypertensive patients (control).

In our study, dyslipidemia is defined as TC ≥ 200 mg/dl, TG ≥ 150 mg/dl, LDL ≥ 130 mg/dl and HDL < 40 mg/dl. Cases have significantlyhigher percentage of dyslipidemics when compared with control.

Table 6: Mean Lipid Values In Different Age-Groups

LIPID	' N '		Percentage (%)	MEAN	SD	' p ' Value
TC	Age (31-45)	24	30.0	189	4.08	*0.049 Significant*
	Age (61-75)	49	54.19	203	4.38	
TG	Age (31-45)	23	37.6	182	12.88	*0.12 In-significant*
	Age (61-75)	44	23.54	217	16.73	
LDL	Age (31-45)	42	20.21	111	4.88	*0.0072 Significant*
	Age (61-75)	39	36.21	127	3.45	
HDL	Age (31-45)	28	52.8	38.7	1.23	*0.0151 Significant*
	Age (46-60)	38	54.3	34.8	0.97	

Three age groups were formed among the hypertensive patients. Group-I: 31-45yrs, group-II: 46-60yrs and group-III: 61-75yrs. The total cholesterol is significantly high among hypertensive patients of group-III when compared with group-I. Significant percentage of dyslipidemics is present in group-III with respect to total cholesterol and triglycerides when compared with groups with lowest lipid values.

Table 7: Mean Lipid Values: Males Vs Females

TC	*Male*	55	198±3.62	***0.50 In-Significant***
	Female	25	195±3.96	
TG	*Male*	41	201±8.29	***0.52 In-Significant***
	Female	39	192±11.88	
LDL	*Male*	42	121±3.11	***0.31 In-Significant***
	Female	40	116±3.89	
HDL	*Male*	58	36.4±0.78	***0.0084 Significant***
	Female	22	39.7±0.96	

Hypertensive females have significantly higher HDL levels when compared with hypertensive

males. Significant values of female hypertensive patients have HDL values near 40 mg/dl (39.7 mg/dl).

Table 8: Mean Values of Dyslipidemia Smokers Vs Non-Smokers

Lipid	Type	N	Mean± SD	*p* Significant value
TC	Smoker	38	219±5.11	*0.00016* *Significant*
	Non- smoker	42	185±2.31	
TG	Smoker	38	230±6.44	*0.0017* *Significant*
	Non- smoker	42	180±6.73	
LDL	Smoker	38	131±5.47	*0.08142* *In-significant*
	Non- smoker	42	119±2.35	
HDL	Smoker	38	40.1±1.55	*0.00301* *Significant*
	Non- smoker	42	33.5±0.81	

Table 9: Percentage Values of Dyslipidemia Smokers Vs Non-Smokers

Lipid	'N'		Percentage	*p* Significant value
TC	Smoker	38	71.56	*0.0087* *Significant*
	Non-smoke	42	32.26	
TG	Smoker	38	97.88	*0.2847* *In-significant*
	Non-smoke	42	86.03	
LDL	Smoker	38	41.22	*0.5017* *In-significant*
	Non-smoke	42	29.01	
HDL	Smoker	38	51.02	*0.39* *In-significant*
	Non-smoke	42	64.50	

Hypertensive smokers have significantly higher TC, TG and HDL values when compared with hypertensive non-smoker males. Hypertensive smokers have significantly high percentage of patients with TC in dyslipidemic range (TC ≥ 200 mg/dl) when compared with hypertensive non-smokers.

Table 10: Mean Lipid Values: Body Mass Index (BMI)

Lipid	Type	N	Mean± SD	*p* Significant value
TC	Obese	51	204±3.11	*0.309* *Significant*
	Non-obese	29	169±3.12	
TG	Obese	51	208±6.22	*0.011* *Significant*
	Non-obese	29	168±6.14	
LDL	Obese	51	119±3.21	*0.0035* *Significant*
	Non-obese	29	111±2.28	
HDL	Obese	51	41.2±1.10	*< 0.0001* *Significant*
	Non-obese	29	32.2±0.58	

Hypertensive patients with BMI ≥ 25 kg/m² are considered obese and < 25 kg/m² as non-obese. Obese patients showed significantly higher values of all lipid parameters.

Table 11: Mean Lipid Values: Stages of Hypertension (HTN)

Lipid	Type	N	Mean± SD	*p* Significant value
TC	*Stage – 1 HTN*	26	189±3.21	*0.19* *In-significant*
	Stage - 2 HTN	54	199±3.38	
TG	*Stage - 1 HTN*	26	195±7.11	*0.86* *In-significant*
	Stage - 2 HTN	54	198±7.10	
LDL	*Stage - 1 HTN*	26	114±3.87	*0.153* *In-significant*
	Stage - 2 HTN	54	121±2.14	
HDL	*Stage - 1 HTN*	26	37.8±0.54	*0.899* *In-significant*
	Stage - 2 HTN	54	38.0±0.81	

Table 12: Percentage (%) Lipid Values: Stages of Hypertension (HTN)

Lipid	Type	N	Percentage	*p* Significant value
TC	*Stage – 1 HTN*	26	42.10	*1.1101* *In-significant*
	Stage - 2 HTN	54	41.01	
TG	*Stage - 1 HTN*	26	81.24	*0.9547* *In-significant*
	Stage - 2 HTN	54	80.11	
LDL	*Stage - 1 HTN*	26	31.11	*0.9887* *In-significant*
	Stage - 2 HTN	54	31.21	
HDL	*Stage - 1 HTN*	26	50.45	*0.7844* *In-significant*
	Stage - 2 HTN	54	53.87	

There is no significant difference in mean lipid values between patients in stage-1 and stage-2 hypertension. There is no

significant difference in percentage prevalence of dyslipidemia among stage-1 and stage-2 hypertensive.

DISCUSSION:

Prevalence of Dyslipidemia

On analysis of the lipid profile of 80 hypertensive patients and 80 normotensive persons the mean TC values in cases and controls are 199 mg/dl and 167 mg/dl respectively. The mean TG values are 199 mg/dl and 123 mg/dl, the mean LDL c values are 121.5 mg/dl and 97.5 mg/dl. All these differences are statistically significant with a 'p' valueof < 0.0001 when analyzed with unpaired T test. The mean HDL (36.8 mg/dl) in hypertensive is significantly lower (p <0.0001) thannormotensive (41.1 mg/dl).

About 42.9 % of hypertensive has high TC (i.e. ≥200 mg/dl) when compared with the normotensives (i.e. 7%). High TG (≥150 mg/dl) is found in 82.14 % of the hypertensive population, whereas it is seen only in 20% of normotensives. The high LDL in the groups is 31.03% and 6%. The low HDL (<40 mg/dl) is seen in 54.1 %of hypertensive and 33% of normotensive. All these values are statistically significant when analyzed using Chi-square test.

The results are similar to the studies conducted by Demudia, J. and Ugwuja, E., 2008 [10] and Chaudhary M, *el al*, 2020 [11] in Nigeria and Bangladesh respectively, which showed a significantly elevated plasma TC, TG, LDL and HDL in hypertensive patients when compared with normotensive patients. Studies conducted by Saha, M. *et al*, 2007 [12] in northern Bangladesh also showed a significantly high TC, TG and LDL values (TC-291.25 mg/dl vs. 182.14 mg/dl, TG-184.77 mg/dl vs. 142.73 mg/dl and LDL-154.32 mg/dl vs. 105.73 mg/dl) and significantly lower HDL values (32.91 mg/dl vs 42.88 mg/dl) in hypertensive patients when compared with normotensive patients. Similar related studies have been reported by Razzak HA *et al* 2018 [13] and Mansour-Ghanaei R *et al* 2019 [14].

Influence of Age

The hypertensive patients included in our study were divided into three age groups (31-45yrs, 46-60yrs, and 61-75yrs) and the mean lipid values of the group were compared. The TC were significantly higher in hypertensive of the group-III when compared with the group-I (mean TC 203 mg/dl vs. 189 mg/dl, p=0.049). The TG, LDL and HDL did not show any significant differences. On analyzing the percentage of dyslipidemia in each group, the

group - I had significantly higher percentage of patients with TC in dyslipidemic range (54.19% vs. 30%, p= p=0.049) when compared with group-III.

Influence of Sex

In this study hypertensive males have significantly lower mean HDL levels when compared with hypertensive females (HDL 36.4±0.78 mg/dl vs 39.7±0.96 mg/dl, p=0.0084). About 63.79% of males were in the dyslipidemic HDL range, when compared with females (40.08%), the value is significant (p=0.0084). Other cholesterols were higher in males but not significantly so. Study conducted by Desai SA, *et al* 200 [15] in Baroda showed hypertensive males have significantly higher TC (200 mg/dl vs. 175.5 mg/dl), TG (176.5 mg/dl vs. 157.3 mg/dl) and LDL (128.1mg/dl vs. 107.7 mg/dl) levels. This favorable profile in females was probably due to the influence of estrogen hormone. In contrast to our study this study showed a significantly higher HDL values in hypertensive males (39.7 mg/dl vs. 36.4 mg/dl). In Nigerian study Demudia, J. and Ugwuja, E., 2008 [10], the TC was significantly higher in hypertensive females (4.45 mmol/L vs. 4.86 mmol/L, p=<0.05) than hypertensive males. The other lipids including HDL-c were higher in females but not in the significant range.

Effect of Smoking

The mean TC, TG, LDL and HDL values in our study were higher in hypertensive smokers when compared with hypertensive non-smoker males. (Mean values: TC-219±5.11 mg/dl vs. 185±2.31 mg/dl, TG-230±6.44 vs. 180±6.73 mg/dl, LDL-131±5.47 mg/dl vs. 119±2.35 mg/dl and HDL- 40.1±1.55mg/dl vs. 33.5±0.81 mg/dl). Among these except LDL all values were statistically significant. The percentage of dyslipidemia is higher among the smoker population with respect to all lipid parameters, but only the TC was significant (Table no 8 and 9).

In the study conducted by Goldman J and Klinger M, *et al*, 2001 [16], it has been recorded that the hypertensive smokers showed higher mean TC (6.23 mmol/L vs. 5.57 mmol/L), LDL-c (3.80 mmol/L vs. 3.76 mmol/L), TG (2.53 mmol/L vs. 1.60 mmol/L) and HDL-c (1.18 mmol/L vs. 1.13 mmol/L). Among these TC and TG were statistically significant. The results were exactly similar to our study. It can be stated that tobacco smoking was found to impact blood pressure and serum lipid levels thus enhancing the cardiovascular risk among smokers [17-18].

Herath Prasanna, *el al*, 2022 [19] has reported that mean value of TC levels 210.0 mg/dl and 192.0

mg/dl for smokers and non-smokers. Likewise for smokers (TG-137.5 mg/dl, HDL-38.5 mg/dl and LDL 134.0 mg/dl) and for non-smokers (TG-102.0 mg/dl, HDL-40.0 mg/dl and LDL 121.8 mg/dl) the given data supports the result of our study conducted. It showed a significantly high TG and others lipid value among smokers while comparing with non-smokers.

The proposed mechanisms by which smoking alters the lipid profile are [20-21]

- Nicotine stimulates the release of adrenaline, leading to increased serum concentrations of FFA.
- FFA is a stimulant of hepatic secretion of VLDL and hence TG.
- HDL-c varies inversely with VLDL-c in serum.
- FFA also stimulates hepatic synthesis and secretion of cholesterol.
- Smoking induces cytochrome p-450 system that degrades anti HT drugs.

Impact of Obesity

Body Mass Index (BMI)

In our study obese patients when defined with BMI of ≥ 25 kg/m² showed significantly high values of TC, TG, LDL and HDL (p values TC-0.309, TG- 0.011, LDL- 0.0035 and HDL- < 0.0001). The percentage of dyslipidemia is also significantly higher among obese patients with respect to TC, LDL and HDL and insignificantly high with respect to TG (Table no 10).

In previous study (58) of Pakistan reported that TC was significantly high among obese hypertensives and LDL, TG and HDL were high but not significant. The study by Desai SA, *et al* 200 [15] also showed the significantly high lipid profile of TC, TG, LDL and HDL among obese hypertensives. The high HDL among obese patients may be due to ample fruit intake and vegetable intake.

The mechanisms of hypertension in obese individuals were poorly understood until recently. Accumulating evidence now indicates a close interaction between visceral adipose tissue and dysfunctional neurohormonal mechanisms, including adiponectin, leptin, resistin, tumour necrotic factor (TNF), and interleukin (IL)-6 caused by increased adiposity (fat deposition). An increase in cardiac output without a corresponding reduction in systemic vascular resistance, which is characteristic of obesity, also probably contributes to the etiology of the hypertension in obesity. On the other hand, the association between dyslipidaemia and hypertension has

been referred to recently as 'lipitension', a condition that is primarily caused by endothelial damage and the loss of physiological vasomotor activity due to atherosclerosis which usually occurs concomitantly with dyslipidaemia [22-27] .

Stages of Hypertension and its Influence

Comparison of lipid profile of Stage - I hypertensive patients with Stage - Π hypertensive patients did not show any significant difference in mean values and percentage prevalence. A study conducted by S.Shari *et al*, 2013 [28] at Lahore showed significantly high values of TC and LDL among stage-Π hypertensive but no significant difference in mean values of HDL and TG.

CONCLUSION:

When compared to people who are normotensive, hypertensive patients have significantly deranged lipid profile and a higher percentage of people who are dyslipidemic. HDLc levels are significantly higher in hypertensive females than in hypertensive males. When compared to hypertensives that are young or middle-aged, older hypertensives have significantly higher total cholesterol values. Hypertensive patients' lipid profiles are significantly affected by smoking. When the BMI is used to calculate obesity, hypertension has a positive correlation with an abnormal lipid profile. The lipid profile of hypertensive patient is unaffected by the stage of their condition.

LIMITATIONS:

The sample size is small. The design of the study is cross sectional. The impact of treatment of dyslipidemia on hypertension and vice versa could not be studied longitudinally.

CONFLICT OF INTEREST:

The authors don't have any conflict of interest.

Conflicts of Interest: Nil

Ethical Approval

Ethical approval was obtained from the Ethical Committee, NIMS Hospital and NIMS University, Jaipur, Rajasthan, (NIMSUR/IEC/2022/206; Dated : 26/03/2022).

Reference

1. Kornitzer, M., Dramaix, M., & De Backer, G. (1999). Epidemiology of Risk Factors for Hypertension. Drugs, 57(5), 695–712.
2. Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJ. Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. Lancet. 2006; 367:1747–1757.
3. Tunstall-Pedoel H, Chen R, Kramarz P. Prevalence of individuals with both raised blood pressure and raised cholesterol in WHO MONICA project population surveys 1989–1997. Eur Heart J. 2004;25(Suppl 1):234. 30.
4. Neaton JD, Wentworth D. Serum cholesterol, blood pressure, cigarette

smoking, and death from coronary heart disease. Overall findings and differences by age for 316,099 white men. Multiple Risk Factor Intervention Trial Research Group. Arch Intern Med. 1992; 152:56–64.

5. Williams B, Mancia G, Spiering W, AgabitiRosei E, Azizi M, Burnier M, Clement DL, Coca A, de Simone G, Dominiczak A, et al. 2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the Management of Arterial Hypertension of the European Society of Cardiology and the European Society of Hypertension. J Hypertens. 2018;36: 1953–2041.
6. Deedwania P. Hypertension, dyslipidemia, and insulin resistance in patients with diabetes mellitus or the cardiometabolic syndrome: benefits of vasodilating β-blockers. The Journal of clinical hypertension. 2011; 13(1):52-59.
7. Strazzullo P, Kerry SM, Barbato A, Versiero M, D'Elia L, Cappuccio FP. Do statins reduce blood pressure: a meta-analysis of randomized, controlled trials. Hypertension. 2007;49(4):792–798.
8. Guerra-López A. Hypertension and dyslipidemia. CardiovascMetab Sci. 2021; 32 (s3): s273-s276. https://dx.doi. org/10.35366/100811.
9. Toth PP, Potter D, Ming EE. Prevalence of lipid abnormalities in the United States: the National Health and Nutrition Examination Survey 2003-2006. J ClinLipidol 2012; 6:325–330.
10. Idemudia, J. and Ugwuja, E. Plasma Lipid Profiles in Hypertensive Nigerians. The Internet Journal of Cardiovascular Research. 2008; 6, 122-178.
11. Chowdhury MR, Akter KS, Bhuiyan SI, Sohel M, Majumder M, Sohan AM, Rahman M, Kabir MA, Ahmed Z. Evaluation of Lipid Profile in Obese and Non-Obese Hypertensive Adult Patients Attended in Medicine Department of a Medical College Hospital of Bangladesh. World Journal of Cardiovascular Diseases. 2020; 12;10(8):520-544.
12. Saha, M., Sana, N., & Shaha, R. K. (2007). Serum Lipid Profile of Hypertensive Patients in the Northern Region of Bangladesh. Journal of BioScience, 14, 93–98.
13. Razzak HA, Harbi A, Shelpai W, Qawas A. Prevalence and risk factors of cardiovascular disease in the United Arab Emirates. Hamdan Medical Journal. 2018 Jul 1;11(3):105.
14. Mansour-Ghanaei R, Mansour-Ghanaei F, Naghipour M, Joukar F. Biochemical markers and lipid profile in nonalcoholic fatty liver disease patients in the PERSIAN Guilan cohort study (PGCS), Iran. J Family Med Prim Care. 2019 Mar;8(3):923-928.

15. SA Desai, UV Mani, SM Deshmukh, UM lyer, AK Sen, RP Patel, Life Style Risk Factors For The Development Of Chronic Degenerative Diseases In An Industrial Set Up In Baroda, int. J. Diab. Dev. Countries. 2000; 20: 113-119.
16. Goldman J, Klinger M. Effect of smoking on the course of essential hypertension: a follow-up study of a group composed predominantly of women. Medical Science Monitor: International Medical Journal of Experimental and Clinical Research. 2001 Nov 1;7(6):1280-1284.
17. Kim, J. H., Shim, K. W., Yoon, Y. S., Lee, S. Y., Kim, S. S., & Oh, S. W. (2012). Cigarette Smoking Increases Abdominal and Visceral Obesity but Not Overall Fatness: An Observational Study. PLOS ONE, 7(9), e45815.
18. Herath P, Wimalasekera S, Amarasekara T, et alEffect of cigarette smoking on smoking biomarkers, blood pressure and blood lipid levels among Sri Lankan male smokers Postgraduate Medical Journal 2022;98:848-854.
19. Brischetto CS, Connar WE, Connar SL,Manarazzo JD, Plasma lipid and lippprotein profiles of cigarette smoking from randomly selected families: Enhancement of hyperlipidemia and deposition of HDL, AM J.Cardiol-1983,52;675-680.
20. Mererson BJ, Reda D,Freis ED,Handerson WG; Cigarette smoking influences with increase of Hypertension, Ann Internal med.1988,148;2116-2119.
21. Akhtar MS, Ansar SM, Abbas N, Ahmad N. Study of blood pressure patterns versus serum lipid parameters in obese human subjects. Medical Journal of Islamic World Academy of Sciences. 2006;16(1):5-10.
22. Michael OA. The relationship between measures of obesity and atherogenic lipids among Nigerians with hypertension. Malawi Medical Journal. 2019 Sep 3;31(3):193-197.
23. Dustan HP. Obesity and hypertension. Diabetes Care. 1991;14(6):488– 504.
24. Landsberg L, Aronne LJ, Beilin LJ, Burke V, Igel LI, Lloyd-Jones D,. Obesity-related hypertension: pathogenesis, cardiovascular risk, and treatment; a position paper of The Obesity Society and the American Society of Hypertension. J Clin Hypertens (Greenwich). 2013;15:14–33.
25. DeMarco VG, Aroor AR, Sowers JR. The pathophysiology of hypertension in patients with obesity. Nat Rev Endocrinol.. 2014; 10:364–376.
26. Dalal JJ, Padmanabhan TNC, Jain P, Patil S, Vasnawala H, Gulati A. LIPITENSION: Interplay between

dyslipidemia and hypertension. Indian J Endocrinol Metab. 2012;16(2):240–245.

27. Li L, Ouyang F, He J, Qiu D, Luo D, Xiao S. Associations of Socioeconomic Status and Healthy Lifestyle With Incidence of Dyslipidemia: A Prospective Chinese Governmental Employee Cohort Study. Front Public Health. 2022 Jun 9;10:878126.
28. Sharif, S., Cheema, A. M., & Khan, M. N. Anthropometric correlates of blood pressure in hypertensive subjects in Lahore, Pakistan. South East Asia Journal of Public Health, 2013; 2(2): 22–27.

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