A PROSPECTIVE STUDY OF DYSLIPIDAEMIA AND OBESITY IN HYPERTENSION PATIENTS

Ponnana Raja Kumar[1], Siripurapu Sasikala[2]

[1]Final Year Postgraduate Student, Department of General Medicine, Konaseema Institute of Medical Sciences, Amalapuram, Andhra Pradesh.
[2]Final Year Postgraduate Student, Department of General Medicine, Konaseema Institute of Medical Sciences, Amalapuram, Andhra Pradesh.

ABSTRACT

BACKGROUND

The association of hypertension and dyslipidaemia is common and been proved by various studies beyond doubt, the reason for this co-occurrence has not been probed out yet. Three possible mechanisms are proposed for this, but none have been proven.

1. Dyslipidaemia can increase the incidence of hypertension.
2. Hypertension can increase the incidence of dyslipidaemia.
3. There may be a common factor, which cause increased incidence of both.

MATERIALS AND METHODS

Patients who are diagnosed as hypertensive study population included patients attending Medicine OPD of Konaseema. Study period is from February 2015 to October 2017. The study design is cross-sectional study with cases and controls. This study is conducted to assess the abnormalities in plasma lipid profile of hypertensive patients and to determine the factors influencing it. Present study is designed to study the prevalence and pattern of lipid profile abnormalities in newly-diagnosed hypertensive patients. To study the influence of various clinical, demographic, social and socioeconomic parameters on lipid profile abnormalities in hypertensive patients.

RESULTS

The total cholesterol, triglycerides, LDL-C and HDL-C are significantly higher in hypertensive patients (cases) when compared with non-hypertensive patients (control). Significant percentage of dyslipidaemias is present with respect to total cholesterol and triglycerides when compared with groups with lowest lipid values. Significantly, higher percentages of prediabetic hypertensive patients have their total cholesterol and LDL cholesterol in dyslipidaemia range when compared with non-diabetic hypertensive patients.

CONCUSSION

Hypertensive patients have significantly higher levels of all forms of cholesterol and higher percentage of individuals in dyslipidaemic state when compared with normotensive persons. Hypertensive females have significantly higher levels of HDL-C when compared to hypertensive males. Elderly hypertensives have significantly high total cholesterol values when compared with young and middle-aged hypertensives. Smoking have a significant impact on the lipid profile of hypertensive obesity.

KEYWORDS

Dyslipidaemia, Obesity, Hypertension.

HOW TO CITE THIS ARTICLE: Kumar PR, Sasikala S. A prospective study of dyslipidaemia and obesity in hypertension patients. J. Evid. Based Med. Healthc. 2018; 5(1), 43-47. DOI: 10.18410/jebmh/2018/9

BACKGROUND

About one third of the adult population in the south East Asia region is having hypertension.[1] Most hypertensive people have no symptoms at all. Hypertension is a serious warning sign that required significant lifestyle changes. So, it is a silent killer.[2] Hypertension doubles the risk of cardiovascular diseases, ischaemic and haemorrhagic stroke, renal failure and peripheral arterial diseases.[3] In our country, the number of people with hypertension are undiagnosed and untreated, so early detection and treatment of hypertension will decrease the complication of hypertension and premature death due to it.[2] Hypertension is defined as a systolic blood pressure equal to or above 140 mm of Hg and/or diastolic blood pressure equal to or above 90 mm of Hg. Though the association of hypertension and dyslipidaemia is common and been proved by various studies beyond doubt, the reason for this co-occurrence has not been probed out yet. Three possible mechanisms are proposed for this, but none have been proven.

1. Dyslipidaemia can increase the incidence of hypertension.

Financial or Other, Competing Interest: None.
Submission 12-12-2017, Peer Review 19-12-2017,
Acceptance 26-12-2017, Published 01-01-2018.
Corresponding Author:
Dr. Siripurapu Sasikala,
Final Year Postgraduate Student,
Department of General Medicine,
Konaseema Institute of Medical Sciences,
Amalapuram, Andhra Pradesh.
E-mail: sasikala@gmail.com
DOI: 10.18410/jebmh/2018/9

2. Hypertension can increase the incidence of dyslipidaemia.
3. There may be a common factor, which cause increased incidence of both.

This study is conducted to assess the abnormalities in plasma lipid profile of hypertensive patients and to determine the factors influencing it. Present study is designed to study the prevalence and pattern of lipid profile abnormalities in newly-diagnosed hypertensive patients. To study the influence of various clinical, demographic, social and socioeconomic parameters on lipid profile abnormalities in hypertensive patients.

MATERIALS AND METHODS

Patients who are diagnosed as hypertensive study population included patients attending Medicine OPD of Konaseema. Study period is from February 2015 to October 2017. The study design is cross-sectional study with cases and controls.

Inclusion Criteria- Newly-detected hypertensive patients of age group between 31-75 years. Control group is non-hypertensive patients of same age group who attended Medical OPD for minor illnesses.

Exclusion Criteria- Patients who are already known hypertensive and on drugs.

1. Patients with secondary hypertension.
2. Newly-diagnosed hypertensive patients with one or more complications like CVA, IHD, nephropathy and retinopathy at presentation.
3. Hypertensive patients who are alcoholic.
4. Hypertensive diabetic patients.

The participants were explained about the study and informed consent was obtained. Cases which meet both the inclusion criteria and did not have any of the exclusion criteria were selected to participate in the study. 107 such cases, 60 controls were included in the study. Detailed history regarding patient's education, occupation, family income, daily physical activities, smoking, alcohol intake and family history of hypertension were asked. The socioeconomic status of the patient was determined using Modified (2007) Kuppuswamy Scale. Participants with daily physical activity of ≤2 MET (metabolic equivalent of task) were considered as sedentary. Those who smoke ≥5 cigarettes/day were considered as smokers. Waist circumference was measured in a horizontal plane at the level of the narrowest part between the costal margin and the iliac crest. Hip circumference was measured at the largest protrusion of the buttock with thin clothes without compressing the skin. Body Mass Index (BMI) was calculated using the formula. BMI = Weight in kg/(height in metre).^{2} The waist-hip ratio was also calculated. Participants with BMI ≥25 kg/m,^{2} waist circumference ≥88 cm in females and ≥102 cm in males and WHR ≥0.85 in females and ≥0.90 in males were considered obese. Blood pressure was measured in the right arm in patient in sitting posture. It was measured after 30 minutes of rest and arm supported at heart level. They were also abstained from smoking and ingestion of caffeine within the previous 6 hours. Two such readings were taken at least 24 hours apart and the average of the two was taken. 5 mL of venous blood sample after an overnight 12 hours fasting was collected for investigation. A 2 hours postprandial sample was also collected. The TC, TG and HDL-C were determined using enzymatic calorimetric method. The LDL-C and VLDL-C were estimated using Friedewald formula. LDL-C = TC - (HDL + VLDL).

Participants with fasting blood sugar values from 100-125 mg/dL and postprandial blood sugar values from 140-199 mg/dL were considered to be prediabetic. Those who had TC ≥200 mg/dL or TG ≥150 mg/dL or LDL-C ≥130 mg/dL or HDL-C <40 mg/dL were considered as dyslipidaemic. Unpaired, double-tailed Student's t-test was used to find out the significance of difference between the two means. The significance of difference in the percentage of dyslipidaemia among each group was analysed using Chi-square test.

RESULTS

107 patients with newly-diagnosed hypertension from hypertension clinic were included in the study group.

60 non-hypertensive persons of same age group were included in the study as control. To study the prevalence of dyslipidaemia, 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 are 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 types of analysis were done. The mean values of total cholesterol and other subgroups of cholesterol are calculated for cases and controls and their differences were analysed for statistical significance. The statistical analysis is done using unpaired t-test, double tailed with unequal variance. The percentage of dyslipidaemia prevalence among cases and controls are calculated and compared. The percentage prevalence is analysed for statistical significance using Chi-square test.

Lipid	'N'		Mean	SE	'P'
TC	Cases	107	197	2.67	<0.0001
	Control	60	166	2.77	Significant
TG	Cases	107	197	7.03	<0.0001
	Control	60	120	5.40	Significant
LDL	Cases	107	119	2.45	<0.0001
	Control	60	98.4	2.74	Significant
HDL	Cases	107	37.9	0.63	<0.0001
	Control	60	42.3	0.98	Significant

Table 1. Mean Lipid Values-Cases Vs. Controls

Interpretation

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

Lipid	'N'		Percentage	'P'
TC	Cases	107	43.92	<0.0001 Significant
	Control	60	5	
TG	Cases	107	84.11	<0.0001 Significant
	Control	60	20	
LDL	Cases	107	28.03	0.0003 Significant
	Control	60	5	
HDL	Cases	107	53.27	0.005 Significant
	Control	60	30	

Table 2. Percentage of Dyslipidaemia Cases vs. Controls

Interpretation- In our study, dyslipidaemia is defined as TC ≥200 mg/dL, TG ≥150 mg/dL, LDL ≥130 mg/dL and HDL <40 mg/dL. Cases have significantly higher percentage of dyslipidaemics when compared with control.

Lipid	'N'	Mean	SE	'P'
TC	Years (31-45)	189	4.08	0.049 Significant
	Years (61-75)	203	4.38	
TG	Years (31-45)	182	12.88	0.12 Insignificant
	Years (46-75)	217	16.73	
LDL	Years (46-50)	111	4.77	0.0072 Significant
	Years (61-75)	127	3.44	
HDL	Years (31-45)	38.4	1.23	0.9637 Insignificant
	Years (61-75)	37.6	0.97	

Table 3. Mean Lipid Values in Different Age Groups

LDL	Years (31-45)	25	20.00	0.2459 Insignificant
	Years (61-75)	47	36.17	
HDL	Years (31-45)	25	52.00	0.9861 Insignificant
	Years (46-50)	35	54.28	

Table 4. Percentage of Dyslipidaemia in Age Groups

Significant percentage of dyslipidaemias is present with respect to total cholesterol and triglycerides when compared with groups with lowest lipid values.

TC	Male	58	198	3.62	0.50 Insignificant
	Female	49	195	3.96	
TG	Male	58	201	8.29	0.52 Insignificant
	Female	49	192	11.88	
LDL	Male	58	121	3.11	0.31 Insignificant
	Female	49	116	3.89	
HDL	Male	58	36.4	0.78	0.0084 Significant
	Female	49	39.7	0.96	

Table 5. Mean Lipid Values - Males vs. Females

Hypertensive females have significantly higher HDL levels when compared with hypertensive males.

TC	Male	58	50.00	0.2448 Insignificant
	Female	49	38.77	
TG	Male	58	87.93	0.2398 Insignificant
	Female	49	79.59	
LDL	Male	58	34.48	0.1063 Insignificant
	Female	49	20.40	
HDL	Male	58	63.79	0.0176 Significant
	Female	49	40.08	

Table 6. Percentage of Dyslipidaemia- Males Vs. Females

Significant percentages of female hypertensive patients have HDL values >40 mg/dL.

TC	Smoker	22	215	6.49	0.00014 Significant
	Nonsmoker	36	188	3.32	
TG	Smoker	22	233	16.98	0.0019 Significant
	Nonsmoker	36	182	6.77	
LDL	Smoker	22	129	6.89	0.07327 Insignificant
	Nonsmoker	36	117	2.55	
HDL	Smoker	22	39.3	1.33	0.00304 Significant
	Nonsmoker	36	34.7	0.85	

Table 7. Mean Lipid Values- Smokers Vs. Nonsmokers

Lipid	'N'		Percentage	'P'
TC	Smoker	22	69.56	0.0085 Significant
	Nonsmoker	36	34.28	
TG	Smoker	22	95.65	0.2236 Insignificant
	Nonsmoker	36	85.71	
LDL	Smoker	22	39.13	0.4018 Insignificant
	Nonsmoker	36	28.57	
HDL	Smoker	22	56.52	0.35 Insignificant
	Nonsmoker	36	68.57	

Table 8. Percentage of Dyslipidaemia Smokers Vs. Nonsmokers

Hypertensive smokers have significantly high percentage of patients with TC in dyslipidaemic range (TC ≥200 mg/dL) when compared with hypertensive nonsmokers.

TC	Obese	74	205	3.12	<0.0001 Significant
	Nonobese	33	77	3.09	
TG	Obese	74	209	9.42	0.011 Significant
	Nonobese	33	171	6.72	
LDL	Obese	74	124	3.24	0.0035 Significant
	Nonobese	33	109	2.40	
HDL	Obese	74	39.6	0.68	<0.0001 Significant
	Nonobese	33	34.1	1.08	

Table 9. Mean Lipid Values - Body Mass Index (BMI)

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

Lipid	'N'		Percentage	'P'
TC	Stage 1	32	43.75	1.00 Insignificant
	Stage 2	75	44.00	
TG	Stage 1	32	84.37	0.9748 Insignificant
	Stage 2	75	84.00	
LDL	Stage 1	32	28.12	1.00 Insignificant
	Stage 2	75	28.00	
HDL	Stage 1	32	50.00	0.6596 Insignificant
	Stage 2	75	54.66	

Table 10. Percentage of Dyslipidaemia- Stages of Hypertension

Lipid	'N'		Percentage	'P''
TC	Prediabetic	35	62.85	0.0059 Significant
	Nondiabetic	72	34.72	
TG	Prediabetic	35	82.85	0.8081 Insignificant
	Nondiabetic	72	84.72	
LDL	Prediabetic	35	42.85	0.0173 Significant
	Nondiabetic	72	20.83	
HDL	Prediabetic	35	42.85	0.1323 Insignificant
	Nondiabetic	72	58.33	

Table 11. Percentage of Dyslipidaemia- Prediabetic vs. Nondiabetic

Significantly, higher percentages of prediabetic hypertensive patients have their total cholesterol and LDL cholesterol in dyslipidaemic range when compared with nondiabetic hypertensive patients.

DISCUSSION

Prevalence of dyslipidaemia- On analysis of the lipid profile of 107 hypertensive patients and 60 normotensive persons, the mean TC values in cases and controls are 197 mg/dL and 166 mg/dL, respectively. The mean TG values are 197 mg/dL and 120 mg/dL, the mean LDL-C values are 119 mg/dL and 98.4 mg/dL. All these differences are statistically significant with a 'p' value of <0.0001 when analysed with unpaired t-test. The mean HDL (37.9 mg/dL) in hypertensive is significantly lower (p <0.0001) than normotensive (42.3 mg/dL). This is similar to the study of Dhananjay Yadav et al and Carr MC et al.[4,5]

About 43.92% of hypertensive has high TC (i.e. ≥200 mg/dL) when compared with the normotensives (i.e. 5%). High TG (≥150 mg/dL) is found in 84.11% of the hypertensive population, whereas it is seen only in 20% of normotensives. The high LDL in the groups is 28.03% and 5%. The low HDL (<40 mg/dL) is seen in 53.27% of hypertensive and 30% of normotensive. All these values are statistically significant when analysed using Chi-square test.

The results are similar to the studies conducted in Nigeria by J. Idemudia E. Ugwuja.[6] Studies conducted by M.S. Saha, N. K. Sana and Ranajith Kumar Saha also support our studies.[7]

Influence of Age- The hypertensive patients included in our study were divided into three age groups (31-45 years, 46-60 years and 61-75 years) and the mean lipid values of the group were compared. The TC were significantly higher in hypertensive of the group-Ш 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 analysing the percentage of dyslipidaemia in each group, the group I had significantly higher percentage of patients with TC in dyslipidaemic range (53.19% vs. 20%, p=0.0151) when compared with group-Ш.

Influence of Sex- In our study, hypertensive males have significantly lower mean HDL levels when compared with hypertensive females (HDL 36.4 mg/dL vs. 39.7 mg/dL, p=0.0084). About 63.79% of males were in the dyslipidaemic 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 S.A. Desai, U. V. Mani, S. M. Deshmukh, U.M. Iyer, A.K. Sen and R. P. Patel support our findings.[8]

In Nigerian study by J. Idemudia and E. Ugwuja, the TC was significantly higher in hypertensive females (4.45 mmol/L vs. 4.86 mmol/L, p=<0.05) than hypertensive males.[6]

Influence of Smoking- The mean TC, TG, LDL and HDL values in our study were higher in hypertensive smokers when compared with hypertensive nonsmoker males (mean values- TC- 215 mg/dL vs. 188 mg/dL, TG- 233 mg/dL vs. 182 mg/dL, LDL- 129 mg/dL vs. 117 mg/dL and HDL- 39.3 mg/dL vs. 34.7 mg/dL). Among these, except LDL, all values were statistically significant. The percentage of dyslipidaemia is higher among the smoker population with respect to all lipid parameters, but only the TC was significant.

In the study conducted by Jaroslaw Goldman and Marian Klinger[9] of Poland, the hypertensive smokers is similar to our study. The study by Mojgan Gharipour and Roya Kelishadi support our study.[10]

Influence of Obesity- 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- <0.0001, TG- 0.011, LDL- 0.0035 and HDL- <0.0001). The percentage of dyslipidaemia is also significantly higher among obese patients with respect to TC, LDL and HDL and insignificantly high with respect to TG. Study by Muhammad S. Akthar and Sayeda M. Ansar in Faisalabad also found same result.[11]

Influence of Stages of Hypertension- Comparison of lipid profile of stage I hypertensive patients with stage – II hypertensive patients did not show any significant difference in mean values and percentage prevalence. A study conducted by S. Sharif, A. Cheema and M. Khan at Lahore showed same result.

Influence of Prediabetic State- The lipid profile of hypertensive patients with their blood sugar values in prediabetic range showed high mean values of TC, TG, LDL and HDL when compared with the values of hypertensive patients with normal blood sugar. Among these, only TC was significantly high.

CONCLUSION

Hypertensive patients have significantly higher levels of all forms of cholesterol and higher percentage of individuals in dyslipidaemic state when compared with normotensive persons. Hypertensive females have significantly higher levels of HDL-C when compared to hypertensive males. Elderly hypertensives have significantly high total cholesterol values when compared with young and middle-aged hypertensives. Smoking have a significant impact on the lipid profile of hypertensives. Obesity when calculated using body mass index and waist circumference correlates positively with abnormal lipid profile in hypertensives, whereas the waist-hip ratio does not show any correlation. Hypertensives who are sedentary and in high socioeconomic status have high prevalence of dyslipidaemia.

REFERENCES

[1] Hypertension fact sheet. World Health Organisation Regional Office of South East Asia 2011.

[2] WHO. A global brief on hypertension: silent killer, global public health crisis. World Health Organization 2013.
[3] Kotchen TA. Hypertensive vascular disease. In: Harrison's principal of internal medicine. 19th edn. McGraw Hill 2015: p. 1611.
[4] Yadav D, Mishra M, Tiwari A, et al. Prevalence of dyslipidemia and hypertension in Indian type 2 diabetic patients with metabolic syndrome and its clinical significance. Osong Public Health Res Perspect 2014;5(3):169-175.
[5] Carr MC, Brunzell JD. Abdominal obesity and dyslipidemia in the metabolic syndrome: importance of type 2 diabetes and familial combined hyperlipidemia in coronary artery disease risk. J Clin Endocrinol Metab 2004;89(6):2601-2607.
[6] Idemudia J, Ugwuja E. Plasma lipid profile in hypertensive Nigerians. The Internet Journal of Cardiovascular Research 2009;6(22):1-6.
[7] Saha MS, Sana NK, Shaha RK. Serum Lipid Profile of Hypertensive Patients in the Northern Region of Bangladesh. J Bio Sci 2006;14:93-98.
[8] Desai SA, Mani UV, Desimukh SM, et al. Life style risk factors for the development of chronic degenerative disease in Baroda. International Journal of Diabetes in Developing Countries 2000;20:112-121.
[9] Goldman J, Klinger M. Effect of smoking on the course of essential hypertension: a follow-up study of a group composed predominantly of women. Med Sci Monit 2001;7(6):1280-1284.
[10] Gharipour M, Kelishadi R, Sarrafzadegan N, et al. The association of smoking with components of metabolic syndrome in non-diabetic patients. Ann Acad Med Singapore 2008;37(11):919-923.
[11] Akhtar MS, Ansar SM, Abbas N, et al. Study of blood pressure parents versus serum lipid parameters in obese human subjects. Medical Journal of Islamic World Academy of Sciences 2006;16:5-10.