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A Study Of Lipid Profile In Hypertensive Patients

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ABSTRACT

In terms of public health, hypertension ranks among the top causes of death and disability worldwide. Untreated hypertensive has a higher prevalence of dyslipidaemia than normotensives do, and lipid levels rise as blood pressure does. This study was directed towards the study of various lipid profile variables in hypertensive patients as well as it compared the lipid levels in IHD and stroke patients.

Aims & Objectives: To study the lipid profile in patients of hypertension, to evaluate the abnormality of lipid profile (TC, TG, HDL-c, LDL-c, VLDL-C, TC/HDLc, LDL-c/HDL-c) in hypertensive patients and to compare the lipid levels in stroke and Ischemic Heart Disease hypertensive patients.

Methodology: This study employed a cross-sectional design. Patients from the OPD as well as those admitted to the ward and intensive care unit of the General Medicine Department at Dhirai Hospital, Sumandeep Vidyapeeth, participated in this study. Out of the 100 individuals who were enrolled in the study, 50 patients with hypertension (both previously diagnosed and newly discovered cases) were chosen to participate in the research. The control population consisted of 50 patients without hypertension or its complications.

Results: In our study, the minimum age of the patient was 24 years and maximum age is 86 years, the mean age was 53.67 years. Most hypertension patients in the study were between the ages of 51-60 years. In our study, 39 patients had hyperlipidaemia; all the parameters in lipid profile were raised in hypertensive population when compared it with healthy controls (normotensives);TC and LDL (P=0.0444) was raised in hypertensive patients having Stroke; the TC/HDL-c levels were raised in males as compared to females; all the parameters in lipid profile were raised in hypertensive population with IHD then with non-IHD patients; among hypertensive patients who consume alcohol, it was observed that TC, TGL and VLDL-c were raised while HDL-c were reduced in the same group.

Conclusion: Our study indicates that the lipid profile of hypertension patients differs significantly from that of non-hypertensive individuals.

Keywords: *Hypertension, Lipid Profile, Stroke, Ischemic Heart Disease (IHD)*

1. INTRODUCTION

Abnormalities in blood lipid and lipoprotein levels, known as dyslipidaemia, are now understood to be a major risk factor for cardiovascular disease (CVD) and primary hypertension that can be treated successfully.[1]

Untreated hypertensive has a higher prevalence of dyslipidaemia than normotensives do, and lipid levels rise as blood pressure does. Despite the fact that hypertensive patients have been found to have abnormally high or low levels of total cholesterol (TC), triglycerides (TGL), and virtually all components of lipoproteins, no single case of dyslipidaemia has been consistently identified among those who also have hypertension.[2]

It is well established that problems in lipid metabolism contribute to hypertension and its associated variations in blood lipid and lipoprotein levels. Furthermore, it has been established that the prognosis of hypertensive individuals who acquire hyperlipidaemia is much poorer. "Low density lipoprotein (LDL) cholesterol may be a modifiable risk factor for hypertension", according to recent studies. According to these research, hypercholesterolemia may be linked to decrease endothelium-dependent vascular unwinding in patients with basic hypertension.[3]

Increased sympathetic activity or peripheral insulin resistance are also risk factors for hyperlipidaemia in hypertensive patients. Recent research has demonstrated that even borderline and Stage I hypertension pose a significant danger to the cardiovascular system and require blood pressure medication. According to the findings of the post-mortem examination of human coronary veins and aortas collected from various sites throughout the world, atherosclerosis is more common and significant in people with hypertension than it is in people with normal blood pressure. Atheroma's seem to occur more frequently and earlier in the heavy-weight sections of the course. Therefore, it is advantageous to examine all CAD risk variables, particularly the lipid profile, when hypertension patients are being evaluated. Distinctive plasma lipids fundamentally alter in different population groups due to variations in topographical, economical, practical, and societal contexts, dietary inclinations, and hereditary makeup. Blood pressure, however, is not the main cause of cardiovascular disease, and coexisting risk variables including age, sex, smoking, weight, diabetes, dyslipidaemia, and others have a significant impact on hypertension patients' susceptibility to damage target organs. The course of target organ damage and, as a result, cardiovascular mortality is significantly influenced by lipoproteins, which are a crucial part of the atherosclerotic process. The goal of the present research was to determine if there is a connection between lipid levels and hypertension.[4]

Recent research suggests that the normal lipid profiles reported by hospital laboratories for patients with cardiovascular disease (CVD) and healthy persons may not be significantly different. Recent studies predict that it will be much more necessary to analyse the sub fractions and subpopulations of each individual lipoprotein.

2. MATERIALS AND METHODS

This study was a cross-sectional study. This study was conducted in patients visiting OPD and in admitted patients in ward and ICU. A total of 100 patients were included in the study, out of which 50 patients with hypertension were selected for the study. The control population consisted of 50 patients without hypertension or its complications. The study commenced after taking ethical approval from the university.

3. INCLUSION CRITERIA

Cases:

1. Age of patient above 18 years.

2. Patients of Primary hypertension, newly diagnosed and known case, with or without any anti-hypertensive medications will be included in the study.

3. Patients with blood pressure more than 140/90 mmHg based on average two readings in newly diagnosed case and one reading in previously known case or patient on any anti-hypertensive medications.

4. Hypertensive patients with complications such as stroke were also included in the study.

Controls:

1. Age and sex matched of non-diabetic, healthy individual with normal blood pressure were be taken as controls after obtaining written informed consent.

4. EXCLUSION CRITERIA

1. Any person who was not willing to participate in the study.

2. Patients with secondary hypertension, Diabetes Mellitus, Chronic Kidney Disease, Hyperthyroidism, Obesity.

3. Any patient receiving lipid altering drug.

5. RESULTS

Out of 50 patients studied among hypertensive group, maximum were in the age group between 51-60 years [16 patients (32%)]. Similarly, among normotensive group maximum were in the age group 51-60years [17 (34%)].

The mean age among hypertensive patients was 55 +13.76 years, while that of non-hypertensive patients was 52.34 ±13.6.

29 patients were male (58%) and remaining 21 patients were female (42%) among hypertensive group. Similarly, 33 male patients (66%) and 17 female patients (34%) belong to non-hypertensive group.

78 % i.e., 39 out of 50 hypertensive patients have hyperlipidaemia, while 26 out of non-hypertensive subjects (52%) have hyperlipidaemia.

Among 23 male hypertensive patients maximum number of patients with hyperlipidaemia were between the age groups 51-60 years and 61-70 years, with 7

patients (30.43%) in each group respectively. 2 male patients were in age group 18-40 years.

Out of 16 female hypertensive patients, 9 patients (56.25%) had hyperlipidaemia who were in the age group between 51-

60years.

Table 1- LIPID LEVELS IN HYPERTENSIVE PATIENTS IN RELATION TO AGE AND SEX

Age	Gender	No	TC (<200)	TGL (<150)	HDL (40-60)	LDL (>110)	VLDL (>32)	TC/HDL (>6)	LDL/HDL (>4)	Systolic BP (>140)	Diastolic BP (>90)
>40	Male	5	206.8 ±37.64	165.6 ±43.46	40.2 ±11.01	116.8 ±28.74	33.12 ±8.69	5.86 ±2.68	3.37 ±1.75	160 ±17.9	99.2 ±10.37
	Female	2	156.5 ±25.71	142 ±10.12	58 ±6.66	96.5 ±16.81	28.4 ±2.02	2.7 ±0.86	1.67 ±0.39	150 ±17.05	96 ±11.15
41 – 50	Male	6	220.46 ±32.1	193.62 ±47.67	35.46 ±8.01	135.95 ±31.98	38.72 ±9.53	6.79 ±1.77	4.22 ±1.33	159.38 ±18.78	100.31 ±14.11
	Female	5	210.86 ±35.12	190.43 ±32.86	38.93 ±10.68	136.44 ±26.22	38.09 ±6.57	5.71 ±1.74	3.78 ±1.25	157 ±22.43	95.43 ±10.05
51 – 60	Male	7	231.86 ±40.12	207.86 ±40.23	31.14 ±8.3	144.54 ±33.68	41.57 ±8.05	7.81 ±2.57	4.87 ±1.75	159.14 ±20.2	100 ±10.66
	Female	9	215 ±34.54	205.78 ±29.02	34.11 ±6.51	146.58 ±43.02	41.16 ±5.8	6.33 ±1.64	4.35 ±1.6	155.56 ±17.95	95.11 ±10.93
61 – 70	Male	7	222.14 ±17.95	207.57 ±53.32	33.43 ±8.21	137.11 ±36.26	41.51 ±10.66	6.89 ±1.92	4.3 ±1.75	164 ±22.98	101.43 ±13.66
	Female	2	207.5 ±37.56	154 ±48.24	35.5 ±7.18	131.35 ±31.05	30.8 ±9.65	5.86 ±1.62	3.74 ±1.2	157 ±18.17	101 ±14.39
> 70	Male	4	238.5 ±30.84	214.75 ±44.84	29.5 ±8.67	154.08 ±29.57	42.95 ±8.97	8.58 ±3	5.47 ±1.94	164.5 ±22.96	99 ±13.41
	Female	3	204 ±19.2	190 ±29.73	34 ±3.77	120.8 ±18.37	38 ±5.95	6.01 ±0.44	3.56 ±0.43	164.67 ±14.51	102 ±13.7

The Total Cholesterol (TC) levels with mean value 238.5 mg/dl has been maximum shown in the males of the age group above 70 years followed by males of the age group 51-60 years with mean TC- 231.86 mg/dl. The mean Triglycerides TGL of 214.75 mg/dl is maximum among the males above the age of 70 years followed by males of the age group 51-60 years with mean of 207.86 mg/dl. Least HDL-C levels with mean of 29.5mg/dl is seen among males above 70 years and maximum HDL-C levels of mean 44.50 mg/dl is seen among males below 40 years. Mean LDL-C level of 154.08 mg/dl is seen among males in the age group above 70 years followed by females of in the age between 51 and 60 years. Highest Systolic BP of mean 164.67 mmHg and Diastolic BP with mean 102 mmHg is seen among females above 70 years. (TABLE-1)

Table 2: COMPARISON OF LIPID LEVELS BETWEEN HYPERTENSIVE PATIENTS AND NON-HYPERTENSIVE PATIENTS

	Hypertensive (N=50)	Non-Hypertensive (N=50)	P-value
	Mean	Mean	
TC	214.02	187.52	P = 0.0001
TGL	189.70	136.24	P < 0.0001
HDL	36.96	42.22	P = 0.0043
LDL	133.12	99.76	P < 0.0001
VLDL	37.94	27.25	P < 0.0001
TC/HDL	6.30	4.76	P = 0.0003

LDL/HDL	3.96	2.55	P < 0.0001
Systolic BP	159.68	124.32	P < 0.0001
Diastolic BP	98.84	78.36	P < 0.0001

Total cholesterol is increased in hypertensives (mean 214.02) which is highly significant when compared to non-hypertensive patients (mean- 187.52). Triglyceride levels in hypertensive patients (mean-189.70) is significantly elevated when compared to non-hypertensive patients (mean-136.24). Mean HDL level in hypertensive patients (36.96) is low when compared to non-hypertensive patients - mean value 42.22. The LDL value is significantly elevated in hypertensive patients (mean-133.12) when compared to controls without hypertension (mean- 99.76). Mean VLDL values in hypertensive patients is 37.94 which is significant when compared to control population with a value of 27.25.

The ratio of total cholesterol to HDL is significantly high in hypertensives (mean 6.32) In comparison to normotensive patients. The ratio of LDL to HDL is 3.99 which is significant when compared to normal patients with values 2.55. (TABLE-2)

Table 3: COMPARISON OF LIPID LEVELS BETWEEN STROKE AND NON-STROKE PATIENTS WITH HYPERTENSION.

	Stroke (N=9)	Non Stroke (N=41)	P-value
	Mean	Mean	
TC	234.00	209.63	P = 0.0112
TGL	219.11	183.24	P = 0.0081
HDL	32.89	37.85	P = 0.1606
LDL	151.41	129.10	P = 0.0444
VLDL	43.82	36.65	P = 0.0082
TC/HDL	7.45	6.05	P = 0.0920
LDL/HDL	4.89	3.76	P = 0.0665
Systolic BP	166.22	158.24	P = 0.0043
Diastolic BP	102.89	97.95	P = 0.0150

Total cholesterol is high in patients of stroke group which is statistically significant.

Also, the triglycerides and LDL-c and VLDL-c levels are significantly higher in the stroke arm compared to the patients without stroke. Total cholesterol to HDL-c ratio and LDL-c to HDL-c ratio is also higher in patients with stroke but statistically not significant. HDL-C levels in the hypertensive stroke patients is on the lower side as compared to Don-stroke patients, but statistically it is not significant. Patients having stroke have significantly raised systolic and diastolic blood pressure with mean BP of 166.22 mmHg and 102.89 mm Hg respectively and as compared to hypertensive patients without stroke. (TABLE-3)

Table 4: COMPARISON OF LIPID LEVELS BETWEEN IHD AND NON- IHD PATIENTS WITH HYPERTENSION.

	IHD (N=3)	Non IHD (N=47)	P-value
	Mean	Mean	
TC	257.67	211.23	P = 0.0319
TGL	231.67	187.02	P = 0.0302
HDL	26.00	37.66	P = 0.0355

LDL	172.93	130.57	P = 0.0173
VLDL	46.33	37.40	P = 0.0448
TC/HDL	9.97	6.07	P = 0.0027
LDL/HDL	6.64	3.79	P = 0.0033
Systolic BP	169.33	159.06	P = 0.0252
Diastolic BP	103.33	98.55	P = 0.1536

Hypertensive patients with ischemic heart disease have significantly deranged lipid levels as compared to that of non-hypertensives. The HDL levels among pts with IHD and hypertension is significantly low in comparison to hypertensive patients. Patients with IHD and hypertension have raised systolic blood pressures (169.33 mmHg) and diastolic blood pressures (103.33 mmHg) which statistically significant as compared to hypertensive patients without IHD. (TABLE-4)

Table 5: COMPARISON OF LIPID LEVELS BETWEEN SMOKERS AND NON SMOKER PATIENTS WITH HYPERTENSION.

	Smokers (N=17)	Non Smokers (N=33)	P-value
	Mean	Mean	
TC	229.29	206.15	P = 0.0026
TGL	204.24	182.21	P = 0.0478
HDL	31.18	39.94	P = 0.0025
LDL	142.82	128.12	P = 0.1049
VLDL	40.85	36.44	P = 0.0485
TC/HDL	7.99	5.43	P < 0.0001
LDL/HDL	5.07	3.39	P = 0.0004
Systolic BP	163.00	157.97	P = 0.0291
Diastolic BP	101.53	97.45	P = 0.0131

TGL and VLDL-c levels are significantly increased in hypertensive smokers than that of non-smokers. while HDL-c levels shows significant fall in smokers with hypertension than the hypertensive patients who do not smoke. Both SBP and DBP shows significant rise in hypertensive smokers than non-smokers. (TABLE-5)

TABLE 6: COMPARISON OF LIPID LEVELS BETWEEN ALCOHOLIC AND NON- ALCOHOLIC PATIENTS WITH HYPERTENSION.

	Alcohol (N=7)	Non-Alcohol (N=43)	P-value
	Mean	Mean	
TC	232.71	210.98	P = 0.0436
TGL	216.29	185.37	P = 0.0424
HDL	30.00	38.09	P = 0.0363
LDL	142.17	131.64	P = 0.3997
VLDL	43.26	37.07	P = 0.0422
TC/HDL	8.63	5.92	P = 0.0023

LDL/HDL	5.38	3.73	P = 0.0143
Systolic BP	160.14	159.60	P = 0.8671
Diastolic BP	100.29	98.60	P = 0.4651

TC levels, TGL, and VLDL-c levels are raised in patients with hypertension who consume alcohol as compared to the same who do not have alcohol. Similarly, HDL-c levels are significantly reduced in hypertensive patients who have alcohol as compared to hypertensive patients who do not consume alcohol. (TABLE-6)

6. DISCUSSION

Approximately 80% of people with hypertension also have concomitant conditions, such as obesity, glucose intolerance, and abnormalities in lipid metabolism.

In our study, the mean age was 53.67 years. Most hypertension patients in the study were between the ages of 51-60 years which contributed to 32 % of hypertensive patients studied, followed by those between 41-50 years. Hyperlipidaemia was present in 23 out of 29 males with a prevalence of 79.31%. In females 21 out of 16 had hyperlipidaemia with prevalence of 76.19%. The overall prevalence was 78%. The TC/HDL-c levels are raised in males as compared to females which is only statistically significant, the remaining lipid parameters in both the sexes do not correlate. A study done by MS Saha et al [3] showed that maximum numbers of hypertensive patients of both sexes were between 50-60 years of age. Hypertensive males were 37.5% while females were 20%. Her study also showed that no significant difference of serum lipid profile between male and female hypertensive patients was found but total cholesterol, triglyceride and LDL-cholesterol were significantly higher in male than female controls whereas HDL-cholesterol was vice-versa.

The present study demonstrates that all the parameters in lipid profile i.e. TC, TGL, HDL-C, LDL-C, VLDL-C, TC/HDL-C, LDL/HDL-C were raised in hypertensive population when compared it with healthy controls (normotensives). Compared to normotensive patients, hypertensive patients had significantly lower HDL cholesterol levels in hypertension. The variations were statistically significant. The change in TC, TGL, HDL-C, LDL-C, VLDL-C, TC/HDL-C, LDL-C/HDL-C was statistically significantly higher in hypertensive patients compared to healthy subjects. According to a study by Diana Shintawati Purwanto et al, [5] hypercholesterolemia was the most prevalent kind of dyslipidaemia seen, followed by LDL-C, increased TG, low HDL-C, and hypercholesterolemia.

In our present study, TC and LDL is raised in hypertensive patients having Stroke, which is statistically significantly. TGL and VLDL-C levels are also raised in stroke patients which is statistically very significant as compared to patients without stroke. The HDL-C levels in our present study is on the lower side in patients with stroke as compared to those without stroke, but it is not statistically significant. Similarly, TC/HDL. and LDL/HDL-c are higher in stroke patients but statistically significant.

Significant findings that demonstrated a correlation between LDL cholesterol levels and the risk of ischemic stroke were observed in studies conducted by Wu (2013) in China [6] and Hakim (2013) in Dr. Kariadi Semarang.[7]

In the present study, Total Cholesterol is seen raised among males above 70 years, while among females it is seen between the age group 51-60 years. Similarly high TGL levels is seen in the males above the age of 70 years and in females between 51-60 years.

From our study we can infer that HDL levels were minimum in males aged above 70 years and maximum among females below 40 years. High LDL-c levels are seen in males above 70 years and in females between 51 to 60 years. The Ratio of TC/HDL-c was maximally increased in males above 70 years and in females between 51-60 years. This research was contrasted with a 1991 study by Bonna K.H. and Thelle D.S.[8] who discovered that the relationship between total cholesterol levels and blood pressure increased with age in men but dropped in women.

In our study, the LDL-c level is raised in hypertensive patients with IHD as compared to those without IHD, which statistically very significant. Other lipid profile parameters such as TC, TGL, VLDL are also raised in hypertensive IHD patients than those without IHD which are statistically significant. On the other hand, HDL-c levels are significantly lower in IHD patients with hypertension when compared to those hypertensive patients without IHD. Systolic BP was raised and showed high significance among IHD patients than non-IHD patients. A study done by Alloubani et al [9] showed the constant positive association between the incidence of IHD and cholesterol concentration of LDL. Misra K.P et al [10] found that LDL-C/HDL-c had more prognostic value than LDL-c and HDL-c alone TGL was a strong indicator of short-term CAD risk especially when LDL-c/HDL-c ratio was high.

In the present study, in hypertensive smokers the values of TGL, TC/HDL- c, LDL-c/HDL-c and VLDL-c were high which was statistically very significant. HDL-c levels among hypertensive smokers were also decreased than those who did not smoke which statistically very significant. LDL-c and TC were also raised in hypertensive smokers but were not statistically very significant.

A study by Syed Sadath et al [11] in 2022 showed that there was significant increase in the levels of serum TC, TAG, LDL-c in smokers with hypertension than non-smokers.

Among hypertensive patients who consume alcohol, in our study it was observed that TC, TGL and VLDL-c were raised which statistically significant while HDL-c were reduced in the same group which was also statistically significant. LDL-c among hypertensive patients who consume alcohol was raised as compared to those who do not consume alcohol, but it was not statistically significant.

In the study done by Hyejin Park et al [12] in 2012, observed that low HDL-c levels decreased with increasing consumption of alcohol among hypertensives as compared to patients who are non-alcoholics, however the trends in prevalence for Trig non-HDL- c (TC, LDL, VLDL, TGL) were not significantly related to increasing intake of alcohol.

7. CONCLUSION

From our study, we can conclude that in hypertensive patients there is significant alteration of lipid profile as compared to normotensive patients. It can be seen that middle aged and elderly patients had hypertension more commonly and males are more affected than females. The prevalence of hypertension is increased in females above the age of 50 years and is almost similar to males after the age of 55-60 years. In patients having hypertension, the levels of Total cholesterol (TC), TGL, LDL-C, VLDL-C, TC/HDL-c and LDL-c/HDL-c are elevated significantly, while HDL-c levels are reduced significantly in the same group. In our study, between males and females, TC levels are raised in males which is statistically significant, while others are not.

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