Original Article

LIPID ABNORMALITIES IN NON OBESE, NON DIABETIC, HYPERTENSIVE PATIENTS

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ABSTRACT

BACKGROUND AND OBJECTIVE: Dyslipidemia and hypertension are among the major contributors in pathogenesis of coronary artery disease and with their coexistence, the risk is not added up, rather it is multiplied. The objective of this study was to determine the frequency of dyslipidemia in non-obese, non-diabetic hypertensive patients and compare it with frequency of the same in non-obese, non-diabetic normotensive subjects.

METHODS: This case control study was carried out over a period of 6 months (2008-9) at Services Hospital Lahore, Pakistan. The study included 120 adult individuals of either gender; 40 non-obese, non-diabetic, hypertensive patients and 80 non-obese, non-diabetic, normotensive individuals. Demographic data and dietary habits were recorded for every subject using a questionnaire. Fasting lipid profile and blood glucose was tested for all subjects. All data was compared between the two groups.

RESULTS:Hypertensive group had higher values for total cholesterol (TC), low density lipoprotein cholesterol (LDL-C) and triglycerides (TG) and lower value for high density lipoprotein cholesterol (HDL-C) as compared to normotensive group. Abnormalities of TC, LDL-C, HDL-C in men only and TG were more frequent in the hypertensive group (Odds ratio =2.96, 2.67, 4.28 and 4.57 respectively). The abnormality of HDL-C in women was similar in both groups (Odds ratio=1.47).

CONCLUSION:Hypertensive individuals are more likely to have various lipid abnormalities i.e., of total cholesterol, LDL-C, HDL-C (men) and triglycerides as compared to normotensive population.

KEYWORDS:Non-obese, Non-diabetic, Hypertensive, Dyslipidemia.

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INTRODUCTION:

Hypertension is a major health problem throughout the world because of its high prevalence and associated increased risk of cardiovascular disease. Advances in its diagnosis and treatment have played a major role in recent dramatic declines in coronary heart disease and stroke mortality in western world.[1] Individuals, who are normotensive at age 55 years, have a 90% lifetime risk for developing hypertension. The higher the blood pressure, the greater the chance of myocardial infarction, heart failure, stroke and kidney disease.1 Hypertension is the most powerful and important modifiable risk factor causing a threefold greater risk of stroke.[2]

There are so many contributing factors, which may play a pivotal role in the genesis of hypertension namely age, sex, occupation, alcohol intake, salt intake, amount of blood pumped by heart, condition of blood vessel and various hormone levels. Among these factors, the role of obesity and diabetes mellitus is universally known.[3]

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Dyslipidemia frequently co-exists with essential hypertension.[4] Proportion of patients with cardiovascular disease morbidities is much greater in patients with concomitant hypertension and dyslipidemia compared with patients having isolated hypertension or dyslipidemia.[5] Total and non-HDL (High Density Lipoproteins) cholesterol levels increase significantly with increasing systolic and diastolic blood pressure in both sexes.[6]

Hypertension has been reported to affect 17.7% of the non-obese and non-diabetic adult population of Punjab, Pakistan.[7] The low density lipoprotein cholesterol (LDL-C) is not a direct cause of hypertension, rather it acts indirectly by accelerating atherosclerosis.[8] HDL-cholesterol is believed to mobilize cholesterol from developing and existing atheromas and transport it to liver for excretion in bile.[9]

Metabolic syndrome is another clinical scenario where the dyslipidemia and hypertension can be seen playing havoc hand in hand with obesity and glucose intolerance. It is the visceral or upper torso obesity, which is the main culprit. Hypertension rarely exists as an isolated condition; rather, it is

present in the constellation of other risk factors.[10]

In 1991, Tromso study11 showed that total and non-HDL cholesterol levels increased significantly with increasing systolic and diastolic blood pressure in both sexes. Baral et al.[12] reported that dyslipidemia is closely associated with hypertension. More over it is hypertension that probably results in convection of LDL and other atherogenic particles into the intima of arteries.[13]

A study was carried out in southern Punjab to see the relation of age and gender with lipid abnormalities in non-obese, non-diabetic, hypertensive subjects.[6] We conducted this study in central Punjab to see the pattern of lipid abnormalities in non-obese, non-diabetic, hypertensive patients in comparison to non-obese, non-diabetic, normotensive subjects.

The non-obese, non-diabetic, hypertensive patients are as important as obese and diabetic patients because Insulin resistance is also found in non-obese individuals and may result in dyslipidemia,[14-16] its presence has been reported in South East Asian population.[17] and non-obese individuals can inherit this problem.[18]

The main objective of this study was to determine the frequency of lipid abnormalities in non-obese and non-diabetic patients having essential hypertension.

MATERIALS AND METHODS:

This case control study was carried out in the Department of Medicine, Unit-III, Services Hospital, Lahore, over a period of six months (2008-09). The study included 120 individuals 35-65 years old from either gender; 40 were non-obese, non-diabetic with essential hypertension (group A, cases), and 80 were non-obese, non-diabetic and normotensive individuals (group B, controls). The patients were selected using non-probability purposive sampling.

Patients having history of myocardial infarction (MI), congestive cardiac failure (CCF), renal failure, cerebro-vascular accident (CVA), impaired glucose tolerance, any other medical illness requiring long term therapy and those on lipid lowering drugs were excluded.

Forty patients in Study Group were enrolled from emergency and out-patient departments of Services Hospital, Lahore. Eighty control subjects were enrolled from Services Hospital Lahore (health care workers and patients' attendants) according to above mentioned criteria. An informed consent was obtained from all study participants and their data were recorded.

Selected individuals were called in the morning with a 10 hour fast. They were seated in a calm environment for half an hour without smoking. Blood samples for biochemical analysis were drawn. Clinical history, like smoking, drugs, family history of dyslipidemia was taken and a targeted physical examination including measurement of blood pressure in sitting posture was carried out. All this information was recorded on a proforma.

Non-obese status was defined on the basis of BMI between 18.5 and 24.9.

Non-diabetic status was defined on the basis of Fasting blood glucose (FBG) level < 100mg/dl (5.6mmol/l) and values between 100mg/dL (5.6 mmol/l) and 126mg/dL (7 mmol/l) were labeled impaired glucose tolerance (IGT).

Essential systemic hypertension was diagnosed if no cause could be found on clinical examination and preliminary laboratory data and in the presence of either of the following: diastolic blood pressure > 90mmHg on at least two visits or average of multiple systolic blood pressure readings > 140 mmHg on two or more visits. Diagnosis of dyslipidemia was made if any of the following was present; total cholesterol > 200mg/dl, triglycerides > 150mg/dl, LDL > 100mg/dl and HDL< than 40mg/dl (men) and 50mg/dl (women).

DATA ANALYSIS:

All the collected information was entered and analyzed using SPSS version 16.0. Quantitative variables like age, duration of hypertension, blood pressure, weight, BMI, blood sugar level and lipid levels were presented by calculating mean+ SD (standard deviation). The qualitative variables like sex, smoking, dietary habits were presented as frequencies and percentages. Odds ratios were calculated for various lipid abnormalities in exposed subjects (Study Group) and unexposed subjects (Control Group).

Table 1: Baseline Characteristics of Study Population:

Parameter		Group-A (n = 40)	Group-B (n = 80)	P value
Age (years) Mean± SD		46.43±7.58	46.96±7.76	0.63
Age Groups (years) - n (%)	35-45	21 (52.5)	40 (50)	1.00
	46-55	12 (30)	28 (35)	0.73
	56-65	07 (17.5)	12 (15)	0.92
Sex- n (%)	Male	23 (57.3)	47 (58.7)	0.896
	Female	17 (42.5)	33 (41.3)	
Smoking- n (%)		15 (37.5)	19 (23.8)	0.12
Fasting blood glucose- Mean± SD		88.83±3.87	89.80±3.95	0.202
Weight (kg) -Mean± SD		66.00±9.86	67.47±9.14	0.419
Height (m)- Mean± SD		1.68±0.10	1.69±0.10	0.642
Body mass index (BMI)- Mean± SD		23.38±1.20	23.66±0.98	0.164

Table 2: Dietary Habits of Two Groups.

Variable	Group-A (n = 40)	Group-B (n = 80)	P value
Consumption of Red Meat -n (%)	09 (22.5)	20 (25.0)	0.763
Consumption of Chicken/ Fish - n (%)	30 (75.0)	59 (73.8)	0.883
Consumption of Vegetables/ Fruits- n (%)	39 (97.5)	76 (95.0)	0.518
Eggs/Dairy Products- n (%)	23 (57.5)	41 (51.3)	0.518
Use of Pulses - n (%)	23 (57.5)	49 (61.3)	0.692
Use of rice - n (%)	13 (32.5)	38 (47.5)	0.117

Table 3: Lipid Profile (in mg/dL) of Two Groups.

Variable	Group-A (n = 40)	Group-B (n = 80)	P value
Total Cholesterol (Mean ± SD)	208.5±43.7	178.4±23.1	<0.001
LDL-C (Mean ± SD)	121.7±29.6	101.5±15.3	<0.001
HDL-C (Mean ± SD)	43.2±7.8	45.8±6.0	0.044
Triglyceride (Mean ± SD)	220.8±99.8	155.5±56.3	0.002

Table 4: Comparison of Two Groups on the basis of Different Lipid abnormalities (values in mg/dL).

Lipid abnormality	Group-A (n= 40)	Group-B (n = 80)	P value
Total cholesterol >200 - n(%)	17 (42.5)	16 (20.0)	0.009
LDL-C >100 - n(%)	27 (67.5)	35 (43.7)	0.014
HDL-C (Men) <40 - n(%)	14 (56.0)	11 (22.9)	0.004
HDL-C (Women) <50 - n(%)	08 (53.3)	14 (43.7)	0.539
Triglyceride >150 - n(%)	27 (67.5)	25 (31.3)	< 0.001

RESULTS:

Mean age was 46.43±7.58 years for Group A (Study group) and 46.96±7.76 years for Group B (Control group) Most of the study participants were between 35-45 years of age i.e. 21 (52.5%) in Group A and 40 (50%) in group B, and lowest number of subjects were in the age group 56-65 years i.e. 7 (17.5%) in Group A and 12 (15%) in group B. For age group 46-55 years, 12 (30%) subjects were in group A and 28 (35%) in group B.

Gender distribution was similar in both groups; 23/40 (57.5%) men in Group A and 47/80 (58.7%) men in group B, Table 1.

Both groups were similar with respect to smoking status, glycemic status, height, weight and BMI (Table. 1).

Mean systolic and diastolic blood pressures in group A were 158.07 ± 9.20 and 102.55 ± 4.8 mmHg. Respective values for group B were 121.04 ± 6.86 and 79.60 ± 6.38 mmHg. Majority of hypertensive patients i.e., 37 (92.5%) in the study group had duration of hypertension between 1 and 5 years (Figure. 1).

Dietary habits of the study group and controls in terms of daily consumption of meat, chicken / fish, fruits / vegetables, eggs / dairy products, pulses and rice is shown in Table 2 and is comparable in both groups.

Table 3 shows mean values of different lipids in the 2 groups. There were significantly higher levels of total cholesterol, LDL-C, and triglycerides in the hypertensive group (A) as compared to normotensive group (B). Level of HDL-C was lower (43.2 ± 7.8 mg/dl) in group A as compared to group B (45.8 ± 6.0 mg/dl.), p=0.044. Table 4 gives a comparison of different lipid abnormalities in the two groups. Our hypertensive group was more likely to have all abnormalities except for HDL-C abnormality in women; [Odds ratio(OR) = 2.96 (95% CI 1.2-7.4) for TC, OR = 2.67 (95% CI 1.12-6.41) for LDL-C abnormality, OR = 4.28 (95% CI 1.35-13.89) for HDL-C abnormality in men, OR = 1.47 (95% CI 0.36-6.01) for HDL-C abnormality in women, OR = 4.57 (95% CI 1.89-11.22) for TG abnormality].

DISCUSSION:

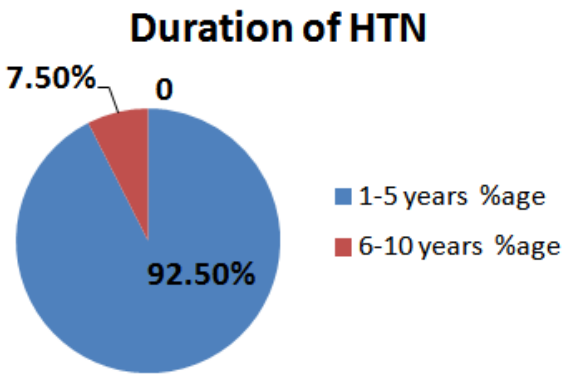
Our single center observational study has shown that there is a possible link between hypertension and lipid abnormalities in non- obese, non-diabetic patients. We found that all lipid abnormalities were more frequently seen in hypertensive group except for HDL-C abnormality in women.

A study by Baral et[12] al showed direct association of dyslipidemia in hypertensive patients whereas Foucan et al[19] have reported findings contradictory to present study; OR = 1.39 for dyslipidemia.

Our results are supported by Lee et al20 who pointed out that combination of dyslipidemia and hypertension is common and more often than could be dictated by chance alone; it may be considered a distinct syndrome.

Saha et al[21] concluded that total cholesterol, triglycerides and LDL-C were significantly raised while levels of HDL-C were significantly lower in hypertensive patients as compared to control subjects which is in agreement with our results. They further noted that no significant changes of lipid profile were found in male and female hypertensive patients, but in control subjects, abnormal lipid profile was more frequently observed in males as

Figure. 1: Duration of Hypertension



compared to females.

Most of our hypertensive patients were from age group 35-45 years. whereas Kotokey et al.[22] reported hypertension to be more common in age group 50-59 years in their study conducted in Dibrugarh district of upper Assam; overall prevalence of hypertension was 27.9% and 54% of the hypertensive individuals had dyslipidemia. Their study population was only urban while we had a mixed population; the other factor that could explain this age group difference is geographic variation. High frequency of dyslipidemia in hypertensive population is in agreement with our study.

Important limitations of our study are a relatively small sample size and dependence on history for data of dietary habits of the subjects as they did not maintain a diet diary. In conclusion, it appears that there is strong likelihood of a possible relation between hypertension and dyslipidemia in non-obese and non-diabetic population. Whether this relationship is an association or a cause and effect relation in either direction cannot be determined by this data. A large scale cohort study may answer these questions.

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