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Lipid Profile Abnormalities among Hypertensive Patients: A Case Control Study

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Abstract

Introduction: Abnormalities in serum lipid and lipoprotein levels are recognized major modifiable cardiovascular disease and essential hypertension risk factors. The objective of this study was to examine the serum lipid patterns of newly diagnosed hypertensive patients attending a tertiary healthcare center. ***Material and Method****:* This is prospective and observational study conducted at Department of General Medicine, Shadan Institute of Medical Sciences over a period of 6 months. The serum lipid profiles of 75 hypertensive patients was studied and compared with those of healthy controls. The serum lipid profiles (TC, TGL.HDL, VLDL, LDL, TC/ HDL, LDL/ HDL ratios) were studied with respect to various clinical profiles like age, sex, type, incidence etc. Study group consisted of patients with hypertension as identified by history, clinical examination, and other relevant examinations. ***Results:*** In our study 36.2 ± 3.8 years was the mean average age of study group whereas for the control group it was 37.7± 3.9 years. In the age group 35-40 years occurrence of hypertension was seen in extreme as compare to other age group. In study groups total cholesterol, triglyceride, HDL Cholesterol and LDL Cholesterol were significantly higher as compared to control group ($p<0.03$). Among the hypertensive subjects most frequently occurring abnormality was elevated TC (70%), followed by elevated LDL (60%). ***Conclusion:*** This study showed that lipid abnormalities are highly prevalent among diagnosed hypertensives.

Keywords: Hypertension; Lipid profile, Cerebrovascular accident; Ischemic heart diseases.

INTRODUCTION

Abnormalities in serum lipid and lipoprotein levels (dyslipidemia) are recognized as major modifiable cardiovascular disease (CVD) risk factors [1] and have been identified as independent risk factors for essential hypertension giving rise to the term dyslipidemia hypertension. [2]

Dyslipidemia is more common in untreated hypertensives than normotensives, and lipid levels increase as BP increases. [3] Though no specific pattern of dyslipidemia has been consistently reported among hypertensive individuals, many studies have shown that total cholesterol (TC), triglycerides (TG), and virtually all fractions of lipoproteins tend to be more frequently abnormal among hypertensive patients than in the general population. In general, black Africans have been reported to have lower serum total cholesterol and higher high-density lipoprotein cholesterol (HDL-C) than whites and other blacks in industrialized countries; however, as in Westernized countries, age, sex, socioeconomic status, and diet also significantly affect lipid levels in healthy Africans. [4]

In Nigeria although the incidence of coronary artery disease and atherosclerosis is still low, it is rising as atherosclerotic lesions of the aorta, coronary, and cerebral arteries are being reported. [5] Hypertension is a powerful risk factor for cardiovascular disease and it remains one of the biggest health and economic issues facing the world [6] and in Nigeria the prevalence of hypertension is known to have varied from 11% to 45%. [7]

Hypertension is known to be associated with alterations in lipid metabolism which gives rise to abnormalities in serum lipid and lipoprotein levels. It has also been documented that presence of hyperlipidemia substantially worsens the prognosis in hypertensive patients. [8]

The frequent clustering of hypertension, lipid abnormalities, and other metabolic abnormalities, in an individual has been clearly demonstrated to be

synergistic in accelerating atherosclerosis and development of CVD. [9] With the current trend of increasing incidence and prevalence of hypertension, CVD, and other no communicable diseases coupled with the persistence of high rates of communicable diseases in most developing countries, these countries have been said to be experiencing a "double burden of disease."

The objective of this study was to examine the serum lipid patterns of newly diagnosed hypertensive patients attending a tertiary healthcare center in South East Nigeria.

MATERIAL AND METHODS

This is prospective and observational study conducted at Department of General Medicine, Shadan Institute of Medical Sciences over a period of 6 months. A total of 75 patients admitted with hypertension were the participants of the study. The patients are in the range of 30-70 years. Both known hypertensive patients who were on treatment for a varying period of time and newly diagnosed hypertensive patients were included in the study.

Inclusion criteria:

For the selection of cases for the present study were as follows: - Patients with essential hypertension with or without complication of hypertension and on medication were included for study. Systolic blood pressure > 140 mm Hg and diastolic >90 mmHg based on average of two readings or one in case of known hypertensive and on antihypertensive medication.

Exclusion criteria:

1. Secondary hypertensive subjects were excluded from the study.
2. Patients with acute illness like high grade fever and first two weeks following surgery were excluded from the study. Purpose of elimination was to obtain a pure picture of relationship between hypertension and serum lipids.
3. Patients with diabetes mellitus, hypothyroidism and those receiving lipid-altering drugs were excluded.

a. Control study: -Control group consisted of 50 subjects.

After selection of cases for the study each patient was subjected for the followings as per format:

1. A detailed history
2. Laboratory investigations
   - Lipid profile – total cholesterol, HDL cholesterol, LDL cholesterol, VLDL, Triglycerides

RESULT

This study was conducted among 150 patients in which study group consists of 75 patients and the control group consists of 75 patients. 36.2 ± 3.8 years was the mean average age of study group whereas for the control group it was 37.7± 3.9 years (table 1). It was also observed that study group were having higher weight than compare to control group. Entire noted demographic details were listed in table 1.

Table 1: Demographic details

Variables	Study group (n=75)	Control group (n=75)
Age (years)	36.2 ± 3.8	37.7± 3.9
Male	55	45
Weight (kg)	62.4 ± 5.8	56.2 ± 5.2
Height (cm)	133.2 ± 6.5	135.2 ± 5.1
BMI (kg/m2)	18.36 ± 3.2	19.23 ± 4.4
SBP (mmHg)	131.6 ± 9.1	87.3 ± 7.9
DBP (mmHg)	78.4 ± 7.9	55.1 ± 4.2

In the age group 35-40 years occurrence of hypertension was seen in extreme as compare to other age group.

Table 2: Mean level of serum lipoproteins

Parameters	Study group (n=75)	Control group (n=75)	P Value
Total Cholesterol (mg/dl)	159.7 ± 13.1	121.4 ± 12.5	<0.03
Triglyceride (mg/dl)	130.57 ± 16.7	91.36 ± 16.1	<0.03
HDL-Cholesterol (mg/dl)	31.41 ± 3.59	36.7 ± 2.7	<0.03
LDL-Cholesterol (mg/dl)	98.41 ± 16.2	77.21 ± 14.2	<0.03

Table 2 demonstrated the distribution of mean level of serum lipoproteins. In study groups total cholesterol, triglyceride, HDL Cholesterol and LDL Cholesterol were significantly higher as compare to control group ($p<0.05$) (table 2). From the above table, the mean total cholesterol was more among study group (159.7 ± 13.1 mg/dl) than controls (121.4 ± 12.5 mg/dl) ($p<0.05$). The mean triglycerides were higher among control groups (130.57 ± 16.7 mg/dl) than controls (91.36 ± 16.1 mg/dl). The mean HDL was low among study group (31.41 ± 3.59 mg/dl) than controls (36.7 ± 2.7 mg/dl) ($p<0.05$). The mean LDL was higher among study group (98.41 ± 16.2 mg/dl) than controls (77.21 ± 14.2 mg/dl) ($p<0.05$). Statistically significant difference was found in between the two groups ($p<0.05$).

Among the hypertensive subjects most frequently occurring abnormality was elevated TC (78%), followed by elevated LDL (66%).

Table 3: Prevalence of serum lipid abnormality

Lipid abnormality	Study group (n=75`)	Control group (n=75)
Elevated TC (> 200 mg/dl)	52 (70%)	1 (1%)
Elevated LDL (> 130 mg/dl)	45 (60%)	2 (3%)
Elevated TG (> 150 mg/dl)	26 (35%)	5 (7%)
Low HDL-C (<40 mg/dl)	22 (30%)	2 (4%)

DISCUSSION

In this study, serum TC, TG, and LDL-L concentrations are significantly higher in hypertensive patients than in normotensive subjects. This is consistent with earlier observations in parts of the world and in other parts of Nigeria. [10] This is unlike the findings of Akintunde [11], Lepira et al. [12] and Kesteloot et al. [13] who reported that the TC, TG, and LDL-C of newly diagnosed hypertensive patients did not differ significantly from that of control subjects, though the newly diagnosed hypertensive tended to have a higher level of LDL-C, TG, TC.

In our study, serum TC concentrations are significantly higher in hypertensive patients than in normotensive sub-jects. This is consistent with earlier observations in parts of the world and in other parts of Nigeria. High levels of serum cholesterol are known to increase the risk of developing macrovascular complications such as coronary heart disease (CHD) and stroke. [14] Many epidemiological studies indicate a progressive increase in CHD risk as the serum TC exceeds 5.0 mmol/L which prompted Lewis [15] to suggest that levels of serum TC in the range 5.0–6.5 mmol/L to be considered undesirable. It is to be noted that there was positive and significant correlation between serum TC and both systolic and diastolic BP in both hypertensive patients and normotensive controls. Similarly, there were statistically significant correlations between serum TC and BMI among both hypertensive and normotensive groups. The hypertensive patients had significantly higher BMI and WHR than the controls. This observation may be due to common risk factors for hypertension, obesity and dyslipidemia as obesity, is known to play a central role in the causation and sustenance of insulin resistance, though our study was a cross-sectional study. The exact pathogen etic mechanisms underlying the CVD risk mediated by dyslipidemia are not fully elucidated, but high levels of serum cholesterol are known to increase the risk of developing macrovascular complications such as coronary heart disease (CHD) and stroke [30]. Epidemiological studies indicate a progressive increase in CHD risk as the serum TC exceeds 5.0 mmol/L. [16] It is thus generally recognized and recommended that treatment of hypertension should, in addition to lowering blood pressure, target correction of dyslipidemia (as well as other CVD risk factors) if present, to reduce over-all CVD risk and increase the cost-effectiveness of therapy.

Isolated low HDL-C was the most common individual lipid abnormality among the study participants especially in the controls among whom it represented 71.4% of all forms of dyslipidemia. Akintunde [11] had earlier reported a similar finding in Osogbo. Odenigbo et al. [17] reported a high rate of low HDL-C among apparently healthy professionals in Asaba, a town which is located in close proximity to Nnewi, our study location. The ATP III guidelines recognize isolated HDL-C as a distinct form of thermogenic dyslipidemia but state that it is not common in the general population. Our data and those of Odenigbo et al. [17] however suggest that isolated low HDL-C may be a relatively common baseline lipid abnormality among the general population in this part of Nigeria and that the presence of hypertension only escalates it. HDL-C can result in endothelial damage and trigger an increase in BP. The exact mechanism by which a low HDL-C increases CVD risk has however not been fully elucidated, though experimental studies suggest a direct role for HDL-C in promoting cholesterol efflux (this is called reverse cholesterol

transport) from foam cells in the atherosclerotic plaque depots in blood vessels to the liver for excretion. HDL-C also exhibits potent anti-inflammatory and antioxidant effects that inhibit the atherogenic process. It has additionally been shown that a low HDL-C level correlates with the presence of other atherogenic risk factor (some of which are emerging risk factors not considered separately during prevalence). According to Pavithran et al. [18] alteration in lipid metabolism including a decrease in HDL-C can result in endothelial damage and trigger an increase in blood pressure which may partially account for its strong predictive power for CHD.

It has long been known that a low level of HDL cholesterol is a powerful predictor of increased cardiovascular risk. [19] Eapen et al. [20] showed that male and female patients with low HDL-C levels(<35 mg/dL) and with normal total cholesterol levels have more cardiovascular events (such as heart attacks and unstable chest pain) as compared to their adult counterparts with high HDL-C levels. There is strong epidemiological evidence that low HDL-C is an independent risk factor for CVD [21] with strong suggestions that interventions to increase HDL-cholesterol will yield clinically significant outcome benefits. The Multiple Risk Factor Intervention Trial [41] showed that each decrease in HDL-cholesterol of 1 mg/dL (0.03 mmol/L) was associated with an increase in the risk of coronary heart disease of 2% in men and 3% in women. It has been shown that a 1% reduction in HDL-C is associated with a 2-3% increase in CHD risk. Mounting clinical and experimental evidence show that HDL-Cs exert multiple anti atherogenic and antithrombotic effects that together are consistent with a marked reduction in the risk of a morbid cardiovascular event, supporting an anti-atherogenic role for HDL-cholesterol. [22] In recognition of its status as a CVD risk factor, ATP III recommends that a low HDL-C (≤40 mg/dL which is equivalent to ≤1.04 mmol/L for both men and women) should be a secondary target of therapy aimed at lipid lowering to reduce CVD risk. However several studies have not borne this out. [23]

Hypertension and dyslipidemia are well known to frequently coexist. The coexistence of hypertension and dyslipidemia has multidimensional clinical implications. First, CVD risk is synergistically enhanced and for this reason, both conditions should be treated aggressively. This association has been linked to background central obesity and consequent insulin resistance which are underlying factors that play major roles in the pathogenesis of both hypertension and dyslipidemia. The results of a 7 year follow-up study on Finnish men suggested that dyslipidemia characteristic of the metabolic syndrome predicted the development of hypertension. [24] Halperin et al. [25] had also shown that dyslipidemia in apparently healthy individual's leads to hypertension. Hausmann et al. [26] in their intravascular ultrasound studies demonstrated that patients with low HDL cholesterol and high TG levels have more extensive coronary atheromas than those with an isolated elevation of LDL cholesterol.

Finally, despite the relatively low incidence and burden of coronary heart disease risk factors in black Africans, high-risk groups such as hypertensives may need to be more fully evaluated for lipid abnormalities and therapy initiated early for those found with lipid abnormalities.

Limitations of the Study

Our study has several limitations. One study limitation is the fact that our study did not collect data from all parts of the country and at best it could only be speculated whether observed relationship is similar all over the country. Secondly being a cross-sectional study by design it cannot observe prospectively and thus cannot associate causal relationships between the factors under study. Finally it is a hospital based study and may not truly represent the population at large as the risk profile of those who did not come to hospital may differ from those who did.

CONCLUSION

This study has shown that lipid abnormalities are highly prevalent among newly diagnosed hypertensive patients in South East Nigeria. Efforts should therefore be intensified to fully evaluate Nigerians with hypertension from a lipid and lipoprotein standpoint, and any abnormalities detected are to be taken into consideration during therapy of this group of high-risk patients.

REFERENCES

1. J. Olusakin, A. D. T. Goji, I. Ezekiel, S. S. Dare, S. B. Mesole, and Y. G. Mohammed, "Evaluation of some risk factors for atherosclerosis in the Circle of Willis observed at autopsy in UCH, Ibadan Nigeria," *Asian Journal of Medical Sciences*, vol. 3, no. 5, pp. 186–191, 2011.
2. G. I. Ahaneku, C. U. Osuji, B. C. Anisiuba, V. O. Ikeh, O. C. Oguejiofor, and J. E. Ahaneku, "Evaluation of blood pressure and indices of obesity in a typical rural community in eastern Nigeria," *Annals of African Medicine*, vol. 10, no. 2, pp. 120– 126, 2011.
3. The AIM-HIGH Investigators, "Niacin in patients with low high density lipoprotein cholesterol levels receiving intensive statin therapy," New England Journal of Medicine, vol. 365, pp. 2255–2267, 2011.
4. T. A. Gaziano, A. Bitton, S. Anand, and M. C. Weinstein, "The global cost of non-optimal blood pressure," *Journal of Hypertension*, vol. 27, no. 7, pp. 1472–1477, 2009.
5. D. E. Laaksonen, L. Niskanen, K. Nyyssonen,¨ T. A. Lakka, J. A. Laukkanen, and J. T. Salonen, "Dyslipidaemia as a predictor of hypertension in

middle-aged men," European Heart Journal, vol. 29, no. 20, pp. 2561–2568, 2008.
6. P. Pavithran, H. Nandeesha, Madanmohan et al., "Dyslipidemia antedates occurrence of clinical hypertension in non-diabetic, non-obese male subjects," *Indian Journal of Physiology and Pharmacology*, vol. 51, no. 1, pp. 96–98, 2007.
7. E. K. Oghagbon and A. B. Okesina, "Pattern of some risk factors for cardiovascular disease in untreated Nigerian hypertensive patients," *West African Journal of Medicine*, vol. 25, no. 3, pp. 190–194, 2006.
8. R. O. Halperin, H. D. Sesso, J. Ma, J. E. Buring, M. J. Stampfer, and J. M. Gaziano, "Dyslipidemia and the risk of incident hypertension in men," *Hypertension*, vol. 47, no. 1, pp. 45–50, 2006.
9. M. R. Akpa, D. I. Agomouh, and D. D. Alasia, "Lipid profile of healthy adult Nigerians in Port Harcourt, Nigeria," *Nigerian Journal of Medicine*, vol. 15, no. 2, pp. 137–140, 2006.
10. C. Borghi, "Interactions between hypercholesterolemia and hypertension: implications for therapy," *Current Opinion in Nephrology and Hypertension*, vol. 11, no. 5, pp. 489–496, 2002.
11. A. A. Akintunde, "Epidemiology of conventional cardiovascular risk factors among hypertensive subjects with normal and impaired fasting glucose," South African Medical Journal, vol. 100, no. 9, pp. 594–597, 2010.
12. F. B. Lepira, J. R. M'Buyamba-Kabangu, K. P. Kayembe, and M.N. Nseka, "Correlates of serum lipids and lipoprotein in Congolese patients with arterial hypertension," Cardiovascular Journal of South Africa, vol. 16, no. 5, pp. 249–255, 2005.
13. H. Kesteloot, C. S. Lee, and H. M. Park, "A comparative study of serum lipids between Belgium and Korea," Circulation, vol. 65, no. 4, pp. 795–799, 1982.
14. B. Lewis, "The appropriate use of diagnostic services: (viii) the investigation of hyperlipidemia: why, how and for whom?" Health trends, vol. 18, no. 1, pp. 1–4, 1986.
15. Jugal Kishore, Neeru Gupta, Charu Kohli, Neeta Kumar. Prevalence of Hypertension and Determination of Its Risk Factors in Rural Delhi. Hindawi Publishing Corporation. International Journal of Hypertension. 2016; 5:1-6.
16. Anil Kumar Mahapatro, Surada Chandrika, Rajyalakshmi Chepuru. A study of lipid profile abnormalities among patients with essential hypertension attending tertiary care center. International Journal of Contemporary Medical Research 2020; 7(1):A1-A4.
17. Pyadala N, Bobbiti RR, Borugadda R, Bitinti S, Maity SN, Mallepaddi PC, Polavarapu R. Assessment of lipid profile among hypertensive patients attending to a rural teaching hospital, Sangareddy. Int J Med Sci Public Health. 2017; 6:71-74.
18. P. Pavithran, H. Nandeesha, Madanmohan et al., "Dyslipidemia antedates occurrence of clinical hypertension in non-diabetic, non-obese male subjects," *Indian Journal of Physiology and Pharmacology*, vol. 51, no. 1, pp. 96–98, 2007.
19. T.V Murali Krishna, Vijaya Kumar Vasa, V A Deepika Ponnuru. The study of correlation between dyslipidemia and hypertension and its complications in 30-70 years age group. IAIM, 2016; 3: 84-90.
20. D. J. Eapen, G. L. Kalra, L. Rifai, C. A. Eapen, N. Merchant, and B. V. Khan, "Raising HDL cholesterol in women," International Journal of Women's Health, vol. 1, no. 1, pp. 181–191, 2009.
21. J Idemudia, E Ugwuja. Plasma Lipid Profiles in Hypertensive Nigerians. The Internet Journal of Cardiovascular Research. 2008; 6:1-6.
22. Charles U. Osuji, Emeka G. Omejua, Emmanuel I. Onwubuya and Gladys I. Ahaneku1. Serum Lipid Profile of Newly Diagnosed Hypertensive Patients in Nnewi, South-East Nigeria. Hindawi Publishing Corporation. International Journal of Hypertension 2012; 6:1-7.
23. Kavindra Borgaonkar, Ranjit Patil, Pradeep Ben. Lipid profile in hypertension: A meta-analysis using western countries data. Med Pulse – International Medical Journal 2016; 3: 967-973.
24. Kelishadi R, Alikhani S, Delavari A, Alaedini F, Safaie A, Hojatzadeh E. Obesity and associated lifestyle behaviors in Iran: Findings from the national non-communicable disease risk factor surveillance survey. Public Health Nutr. 2008; 11:246-51
25. The AIM-HIGH Investigators, "Niacin in patients with low high density lipoprotein cholesterol levels receiving intensive statin therapy," New England Journal of Medicine, vol. 365, pp. 2255–2267, 2011.
26. D. E. Laaksonen, L. Niskanen, K. Nyyssonen,¨ T. A. Lakka, J. A. Laukkanen, and J. T. Salonen, "Dyslipidemia as a predictor of hypertension in middle-aged men," European Heart Journal, vol. 29, no. 20, pp. 2561–2568, 2008.