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Abnormal Lipoprotein as A Determinant of Increased Blood Pressure: A Community Based Study in Rural Nagpur

Dr Sanjay Kumar[1], Dr Deepanjan Ray[1], Dr Sk. Samim Ferdows[2], Dr. Gautam Ghose[3], Dr Mrs. P. M. Durge[4]

[1]Assistant Professor, Department of Community Medicine ,IQ City Medical College, Durgapur ,West Bengal.

[2]Assistant Professor, Department of Community Medicine and Biostatistician , IQ City Medical College, Durgapur ,West Bengal.

[3]Professor and Head of the Department of Community Medicine ,IQ City Medical College, Durgapur ,West Bengal.

[4]Professor and Head of the Department of Community Medicine, NK Salve Institute of Medical Sciences and Research Center. Nagpur, Maharastra.

Corresponding author:

DR. Deepanjan Ray
Address: C 87,New Garia Housing Development Co operative Society,Kolkata-700094.
Email id:babai.bsmc@gmail.com, Phone no.: 09903138727.

Abstract:

Introduction: Hypertension is a modern epidemic. Dyslipidemia with hypertension increase cardiovascular morbidity by many folds. Abnormal lipoprotein profile itself associated with raised blood pressure. The study was conducted to find out the proportion of dyslipidemia and any association between the different

Address for correspondence:

**The Editor/ Managing Editor,
Journal of Comprehensive Health
Dept of Community medicine
NRS Medical College,
138, AJC Bose Road, Kolkata-700014**

components of blood lipids with hypertension. **Methodology:**It was a cross sectional study conducted in rural area of Nagpur among 574 adult subjects. Biochemical investigation was undertaken among 110 subsample and statistical tests were conducted with the help of SPSS software, version 19.0. **Results:** Prevalence of hypertension and dyslipidemia was 17.9% and 83.63% respectively. Positive correlation was found between SBP and Cholesterol, LDL-C. **Conclusion:**Regular screening for blood pressure and lipoprotein profile in community and adequate management will have beneficial role in prevention of development of early cardiovascular disorders in population.

Key Words:Hypertension,Dyslipidemia,Cholesterol, LDL

Introduction:

Hypertension is a modern epidemic. With epidemiological transition hypertensionhas been spreading it's boundary from developed to developing regions in the world. Prevalence of adult hypertension in India ranges from 25% in urban area to 10-15%in rural area ascompared to global data of 40% prevalence.[1,2] Hypertension is generally perceived to be a result of many contributing factors such as genetic predisposition, dietary factors such as excess salt intake and cholesterol and psychological factors such as anxiety and stress of the modern day life style.

Hypertension is a silent killer and hypertensive patient die prematurely. This is because of the effect of hypertension on the three target and vital organs like the heart, brain and kidneys. The chronically elevated blood pressure (BP) by itself can affect these organs directly or damage the arterial tree which in turn affects other various organs systems.[3]Cardiovascular morbidity and mortality associated with hypertension increase by many folds when it is associated with other factors like dyslipidemia, fasting hyperglycemia and abdominal obesity, collectivelyknown as 'Metabolic Syndrome'.[4] Hypertension and hypercholesterolemia has synergistic effect rather than additive effect in causation of coronary artery disease.Study supports biological interrelation between blood pressure and blood lipids.[5]By keeping this

background the present study was contemplatedto find out the proportion of dyslipidemia and any association between the different components of blood lipids with hypertension among adult subjects of rural Nagpur.

Methodology:

This study was a community based cross sectional study, conducted in a rural field practice area ofNKP Salve Institute of Medical Sciences and Centre, Nagpur, which is a tertiary care hospital from December 2008 to April 2009. The total population of this village was 7532 and the adult population (18 years and above) was 4516 (Census 2001). Initially, a pilot study was carried out upon 100 adult subjectsfrom a neighbouring village to estimate the prevalence of hypertension, which came out to be 23%. Using this prevalence (23%), sample size was calculated as 574, by using the formula $N = Z_\alpha^2 pq/ L^2$, where, $Z_\alpha = 1.96$ (Standard normal deviate at desired confidence level 95%), p = 23, q = 100 – p, L = allowable error. All the adult population of both sexes from that village comprised our study population. At first, sampling frame was constructed with the 4516 adult population with help of recent census report. Then sample interval was calculated to be 7 by 4516/574. At first, one random number was chosen which is equal or less than 7, and it came out to be 4. So, the 4^{th} person was selected, and then every 7^{th} person was selected subsequently i.e. 11^{th}, 18^{th}, 25^{th} and so on.

Blood pressure was measured for all 574 subjects, but due to constraint of economic resources and time, every fifthstudy subjects was selected for biochemical estimation (lipid profile) through systematic random sampling after obtaining informed written consent for undergoing blood test. Altogether one hundred and ten person underwent biochemical evaluation for lipoprotein profile .

Total serum cholesterol,triglyceride, HDL and LDL levels were estimated under lipoprotein profile. Total cholesterol level≤ 200mg/dl, triglyceride level ≤150 mg/dl, HDL≥40mg/dl and LDL≤130 mg/dl considered normal, any deviation from above mentioned parameters were considered as Dyslipidemia.[6]

Blood pressure was measured in a seated posture, with feet on the floor and arm

supported at heart level by using the auscultatory method with a standardized calibrated mercury column sphygmomanometer with an appropriate sized cuff encircling at least 80% of the arm. Measurement was taken, only when the persons were seated quietly for at least 5 minutes in a chair and who avoided caffeine, exercise and smoking at least 30 minutes prior to measurement. Altogether, two measurements were made; and the average was recorded. SBP is the first of two or more sounds is heard (phase 1), and DBP is the point before the disappearance of sounds (phase 5). Operational definition of hypertension was taken from The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII).[7]The study subjects found to be hypertensive and who needed referral were referred to our tertiary care hospital for consultation and further management.

Statistical analysis: Collected data were compiled in Microsoft Excel worksheets (Microsoft, Redwoods, WA, USA). Normality of datawas seen by Kolmogorov-Smirnov statistic. A non-significant result (P value of more than 0.05) indicated normality. Distribution of variables between two groups was analysed using Mann Whitney U test.Degree and direction of relationship between two continuous variables was checked by partial correlation coefficient consisting of six variables. P value less than 0.05 was considered as statistically significant.All the statistical analysis was done in SPSS software, version 19.0.

Result:

Mean age of the 574 study population was 38.62±14.44 years. Prevalence of hypertension was found to be 17.9% with mean systolic blood pressure 120.19±11.70mm of Hg and mean diastolic blood pressure 79.69±7.33 mm of Hg.

Mean Cholesterol, Triglyceride, HDL and LDL level were 175.15±44.87, 155.89±67.73, 39.26±7.34 and 107.27±39.53 mg/dl respectively.

Prevalence of hypercholesterolemia, hypertriglyceridemia, low HDL and high LDL were 22.7%,47.3%,68.2% and 22% respectively. Overall, prevalence of dyslipidemia among subpopulation (n=110) was 83.63%.

Table 1: Distribution of Biochemical Variables of Lipid profile according to Presence of Hypertension. **n = 110**

Lipid Profile markers	Hypertension		No Hypertension		P value
	Frequency No. (%)	Mean ± SD	Frequency No. (%)	Mean ± SD	
Cholesterol <200 mg/dl	35 (64.81)	187.39 ± 48.36	50 (89.28)	163.35 ± 38.04	0.014*
Cholesterol≥ 200 mg/dl	19 (35.18)		6 (10.72)		
Triglyceride <150	24 (44.44)	168.34 ± 63.20	34 (60.72)	143.88 ± 70.31	0.006*
Triglyceride ≥150	30 (55.55)		22 (39.28)		
HDL≥40	17 (31.48)	38.99 ± 4.25	18 (32.14)	40.09 ± 9.38	0.269
HDL<40	37 (68.52)		38 (67.86)		
LDL<130	37 (68.52)	115.48 ± 44.70	48 (85.71)	99.20 ± 32.40	0.136
LDL≥130	17 (31.48)		8 (14.29)		

Among the subsample of 110 who underwent biochemical investigation, 54(49.09%) were hypertensive and rest were either normotensive or pre hypertensive. Among hypertensive mean level of cholesterol,Triglyceride,HDL and LDL were found to be 187.39 ± 48.36, 168.34± 63.20, 38.99±4.25 and 115.48±44.70mg/dl respectively, while in non Hypertensive group these value were 163.35±38.04, 143.88±70.31, 40.09±9.38 and 99.20±32.40 mg/dl respectively. Significant statistical difference was found between mean cholesterol and triglyceride value in these two groups.[1]

Table 2: Correlation Matrix showing relationship between two dependent and four independent variables.

n = 110

Variables	Systolic BP	Diastolic BP	Cholesterol	Triglyceride	HDL	LDL
Systolic BP	1.000	0.370*	0.273*	0.147	-0.175	0.219*
Diastolic BP		1.000	0.124	0.146	-0.044	0.073
Cholesterol			1.000	0.481*	-0.166	0.907*
Triglyceride				1.000	-0.247*	0.168
HDL					1.000	0.064
LDL						1.000

Correlation matrix was prepared considering two dependent variable systolic blood pressure and diastolic blood pressure and four independent variableslike cholesterol, triglyceride, HDL and LDL considering age as controlling factor in partial correlation.Only cholesterol and LDL value has significant correlation with systolic blood pressure, while no significant correlation was observed between diastolic blood pressure and independent variables.

Discussion:

Prevalence of Hypertension in this study was 17.9%.Overall 22.01% prevalence of hypertension in central India wasreportedby Jonas J. B. et al,the finding is similar to the present study.[8]In Tirupati, Reddy S. S. et al observed overall prevalence of hypertension as 8.06% which is much lower than the present study.[9]Prevalenceof hypertension in rural Wardha district was 21.08%[10], while in Lucknow prevalence was 23.3%.[11] These findings were similar to the present study.

Prevalence of dyslipidemia among study population was found to be pretty high (83.63%). We found significant difference in distribution of mean cholesterol and triglyceride between hypertensive and not hypertensive groups. Significant positive correlation was observed between systolic blood pressure and variables like cholesterol,LDL. No significant correlation was observed between diastolic blood pressure and other biochemical variables; in both cases age was adjusted. Similarly in a hospital based study in Iran,

positive correlation was observed between mean systolic blood pressure and mean LDL cholesterol(r=0.196) and inverse correlation between HDL cholesterol and SBP(r= -0.177).No significant correlation was observed between mean diastolic Blood Pressure and other biochemical variables.[12]

In Norway,a study among 15744 subjects revealed positive correlation between Cholesterol and both systolic and diastolic blood pressure for men and women. There was increase in serum cholesterol level with increase in blood pressure (SBP and DBP).[5]In Gujrat, a study among adolescents had found significant correlation between adiposity and SBP,DBP for both boys and girls.[13]

Thus it is evident that blood pressure has positive correlation with components of lipoprotein profile and both of them have multiplicative role in causation of cardiovascular disease. Hence regular screening for blood pressure and lipoprotein profile in community and adequate management will have beneficial role in prevention of development of early cardiovascular disorders in population.

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