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LETTER TO THE EDITOR

DYSLIPIDEMIA ANTEDATES OCCURRENCE OF CLINICAL HYPERTENSION IN NON-DIABETIC, NON-OBESE MALE SUBJETCS

Sir,

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The seventh report of the Joint National Committee (JNC 7) for prevention, detection, evaluation and treatment of high blood pressure has included a new classification of blood pressure (BP) called prehypertension (1). The committee maintains that it is not a disease category but a terminology that has been chosen to draw attention of individuals who are at a high risk of developing hypertension later in their life. This has met with a lot of criticism, as a large number of apparently normal people will fall in this category (2, 3**)**. Individuals with prehypertensive BP have been found to have an increased risk of developing cardiovascular disease as compared to those with optimal levels (4). The presence of one or more cardiovascular risk factors like higher levels of total cholesterol (TC), low density lipoprotein cholesterol (LDL-C), triglyceride (TG), glucose, insulin, body mass index (BMI), a decreased high density lipoprotein cholesterol (HDL-C) and a less favorable body fat distribution have been found to increase the progression of prehypertension to hypertension (5). Prehypertension has also been found to be associated with an increased risk of myocardial infarction and coronary artery disease (6). In borderline hypertensive patients, the occurrence of vascular structural changes related to age and HDL-C rather than BP levels has been demonstrated previously (7). A prospective study by Halperin et al has found that dyslipidemia in apparently healthy individuals can lead to hypertension at a later stage **(**8**)**. *Even though there are many studies on prehypertension from foreign countries, there is scarcity of data on the relationship between fasting blood glucose, lipid profile and BP prior to the onset of frank diabetes, obesity and clinical hypertension in India.* In the present study, we examined for the possibility that there might be differences in fasting blood glucose and lipid profile in male subjects with prehypertension compared to normotensive controls. It is well known that diabetes and obesity are associated with hypertension. However, the purpose of excluding diabetics and obese in the present study was to investigate whether abnormalities in lipid profile are associated with non-obese, non-diabetic male prehypertensives.

The subjects recruited included the non-teaching staff of Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry, and outpatients who visited our laboratory for a BP check (n = 102). Written informed consent was taken from all the participants of the study. The Institute Ethics Committee approved the study protocol. Subjects were classified as normotensive, prehypertensive and hypertensive as per the *Joint National Committee* report. BP was measured in both the arms using a mercury sphygmomanometer (Diamond, India) after five minutes rest in

the sitting position. The higher of the two similar BP readings was taken for analysis. Blood pressure measurement was repeated after one week to confirm the BP levels. If the systolic and diastolic BP were in different categories, the higher of the two was used to classify.

Persons with BMI > 30 kg/m^2 and fasting blood glucose (FBG) > 126 mg/dl were excluded. As mentioned earlier, the purpose of excluding diabetics and obese subjects was to investigate whether abnormalities in lipid profile associated with non-obese, non-diabetic male prehypertensives. Newly diagnosed hypertension was defined as sustained elevation of SBP (≥ 140 mm Hg) and or DBP (≥ 90 mm Hg) during the course of the study and had no previous history of antihypertensive medication.

Height and weight were measured and BMI was calculated as weight in kg divided by height in units of meter squared. All subjects were requested to report to the *laboratory* at 8 am after an overnight fast. Five milliliters of venous blood was collected in vials containing *ethylenediaminetetraacetic acid (1 mg/ml)*. Plasma was separated out and used for analysis. Total cholesterol was analyzed by cholesterol oxidase method (9), TG by glycerol oxidase method and HDL-C by phosphotungstate magnesium acetate method using reagent kit from Agappe Diagnostics (Maharashtra, India) adapted to 550 express plus random access auto analyzer (West pole, Germany). LDL-C was calculated by Friedwald's formula (10).

All data are presented in Table I. There was no significant difference in fasting blood glucose levels between the groups (P>0.05). Total cholesterol, triglycerides, LDL-cholesterol and VLDL were highest in either stage I or stage II hypertensives as compared to normotensives. In prehypertensives, diastolic pressure correlated best with fasting blood glucose (r = 0.48), triglyceride (r = 0.5), HDL-cholesterol (r = –0.4), VLDL-cholesterol (r = 0.5), P<0.05 for all correlations (Pearson's correlation coefficient analysis. Corresponding correlations were not significant in hypertensives. Total cholesterol and LDL-cholesterol were found to be significantly higher (P<0.05) in prehypertensives as compared to that of normotensive controls.

TABLE I: Age, baseline BP, fasting blood glucose, and lipid profile. BMI: body mass index, FBG: fasting blood glucose, SBP: systolic pressure, DBP: diastolic pressure, PP: pulse pressure in various groups.

	Normotensives (n = 20)	*Prehypertensives (n = 32)*	*Hypertensives*	
			Stage 1 (n = 30)	*Stage 2 (n = 20)*
Age in years	38±8	40±9	41±12	43±8.08
BMI (Kg/m^2)	23.7±3.2	25.3±3.1	24.6±3	23.9±4.1
FBG (mg/dL)	88±18	94±19	94±15	105±10
SBP (mmHg)	113±5	121±8	139±7	162±20
DBP (mmHg)	71±3.81	81.37±3.67	91.48±3.16	105±10
Total Cholesterol (mg/ dL)	166±31	185±30*	187±36*	195±35**
Triglycerides (mg/dL)	102±41	125±55	134±63	149±70*
HDL Cholesterol (mg/dL)	51±9	46±9.8	41±9.1**	38±8.9***#
LDL Cholesterol (mg/dL)	97±27.7	115±29*	121±33*	127±17**
VLDL Cholesterol (mg/dL)	20±7	25±11	27±12*	30±14**

Data are the means ± SD. ANOVA with post-hoc test revealed, *P<0.05, **P<0.01, ***P<0.0001 compared to normotensive controls, an #P<0.001 compared to prehypertensives.

The major new finding in the present study is the presence of higher levels of total and LDL cholesterol in prehypertensives as compared to normotensives. In a recently published large population study, *it has been demonstrated* that dyslipidemia antedates and predicts the risk of cardiovascular disease and hypertension (8). Alteration in lipid metabolism including an increase in total cholesterol, decrease in HDL–C and increase in LDL-C can result in endothelial damage and trigger an increase in BP. Furthermore, the presence of a positive correlation between *diastolic pressure* and LDL cholesterol suggests that treatment strategies in prehypertensives *may include* the issue of cholesterol lowering interventions. These findings suggest for a routine evaluation of cholesterol levels starting from prehypertensive stage to check their progression to full-blown hypertensives. In conclusion, this study indicates that abnormalities in lipid profile antedate the occurrence of stage I hypertension. Therefore, it is advisable to use lipid profile in addition to BP in evaluating the risk associated with prehypertension.

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