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Assessment of HDL Associated- Pon-1 and Lipid Profile In Prehypertensive and Hypertensive Women

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ABSTRACT

Few studies have investigated the association of cardiovascular risk with visceral fat accumulation. . Increased visceral fat accumulation is a strong predictor of arterial hypertension. The aim of this study was to investigate whether pre-hypertension and hypertension status is associated with activity of paraoxonase (PON-1) in a random sample of cardiovascular disease-free women. In this case-control study, 47 pre-hypertensive women, 42 hypertensive women and 45 healthy controls were included. General information was gathered using questionnaires and face-to-face interviews. Blood pressure and anthropometric measurements were measured for each subject. Venous blood samples were drawn from subjects and plasma was separated. Activity of Paraoxonase and lipid levels were evaluated in selected subjects. Forty –seven (35%) and 42 (31.3%) participants were pre-hypertensive and hypertensive, respectively. The hypertensive and pre-hypertensive women had lower paraoxonase activity ($p < 0.001$) and higher lipid levels ($p<0.001$) compared to normotensives. Moreover, significant differences were also observed between hypertensive and pre-hypertensive women in paraoxonase activity ($p < 0.001$) as well as in lipid profile ($p<0.001$). The present findings show that activity of HDL associated paraoxonase decrease in pre-hypertensive and hypertensive women while lipid levels were found increased, which may eventually lead to atherosclerosis and other high blood pressure related health problems.

Key words: Paraoxonase, Hypertension, Prehypertension.

INTRODUCTION

Hypertension is a common health problem in developed countries.[1]Untreated high blood pressure leads to many degenerative diseases, including heart failure, renal disease and coronary heart disease.[2]Based on recent report of the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC VII), individuals who had systolic blood pressure between 120 and 139 mmHg or diastolic blood pressure between 80 and 89 mmHg are categorized as pre-hypertensive.[3] In other words, this is the group at high risk for developing essential hypertension and CVD. Hypertension is a risk factor for the development of atherosclerosis. As the cellular and molecular mechanisms of the pathogenesis of atherosclerosis and the effects of hypertension are being more clearly defined, it becomes apparent that the two processes have certain common mechanisms. The endothelium is a likely central focus for the effect of both diseases.In the present study, the activity of paraoxonase and lipid profile in pre-hypertensive and hypertensive women were analyzed. Perhaps, findings of this study could cast some light on the mechanism underlying the increased risk of cardiovascular diseases in subjects with pre-hypertensive and hypertensive blood pressure levels.

MATERIAL AND METHODS

The subjects selected for this study were recruited from women receiving the services of OPD of Medicine Department, HamidiaHospital, Bhopal (M.P.). In this study, 134 women of 20-45 years old were randomly selected. The including criteria were: 1) not being pregnant and lactating, 2) not having any kind of cancer, cardiovascular, diabetes, renal and liver diseases, and 3) not taking any vitamin or mineral supplements. All participants were informed about the aims and procedure of the study and signed written consent. General data were gathered from samples using questionnaires and face-to-face interviews. Data collecting form included demographic characteristics (age, number of pregnancies and education), and detailed medical history and lifestyle habits, such as smoking status and physical activity. Physical activity was classified as active if subjects reported "moving, walking and working energetically and participating in vigorous exercise"; otherwise, they were classified as inactive.

Arterial blood pressure (BP) was measured with a mercury sphygmomanometer. All subjects were at least 15 minute at rest in a quiet environment. Blood pressure measurements were taken at the right arm relaxed and well supported by a table, with an angle 45° from the trunk. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were averaged by using three readings measured at 5 minute intervals. Differences of < 5 mmHg were allowed. Study participants were divided into three groups according to their average SBP and DBP levels. Subjects whose average BP levels were greater or equal to 140 mmHg/90 mmHg or were under antihypertensive medication or physician has told them that they have hypertension but they were untreated were classified as hypertensive. Participants who had mean systolic/diastolic blood pressures within the range of 120-139 mmHg/80-89 mmHg and they had never been told that they have high BP levels are defined as pre-hypertensive as it has recently suggested by the Seventh Report of the Joint National Committee on the Prevention Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII).[3]Forty seven women were recruited as a pre-hypertensive group and 45 healthy, normotensive women were selected as a control group. Forty -two women were also recruited as hypertensive group.

Blood samples were obtained by puncture of anticubital vein. 8 ml of blood was collected in plain vials. Blood samples were centrifuged at 3000 rpm for 10 minute. After which the serum was separated for the estimation of PON-1and lipid profile. All analytes were measured in Auto analyzer. Paraoxonase was estimated spectro photometrically by theCharlton Menys.V method, [4]All lipid parameters(Total Cholesterol, Triglycerides&HDL Cholesterol were estimated by using commercially available reagent kits on MERCK semi-autoanalyser.LDL and VLDL were calculated by using Friedwalds formula. [5]

The statistical analysis was done by using the Statistical Pack-age for Social Sciences (SPSS 17). The results were expressed as Mean±Standard Deviation (SD). The differences between the groups were analyzed by using the Student's "t"-test and one way ANOVA.The p value <0.001 was considered as highly significant, p value <0.01 as moderate significant while p value >0.05 as insignificant.

Limitations of the study

The present study has shown that there is a reduced level of serum paraoxonase activity, but the limiting factors in the study are:

The study group was small and had both treated and untreated cases. Large scale study is needed to establish a relation between the paraoxonase activity by taking into consideration the treatment aspect and the type of therapeutic agent administered.

The significance of the paraoxonase activity in the development of atherosclerotic disease in the essential hypertensives has to be established.

The possible beneficial effect of the certain groups of antioxidant supplements on the paraoxonase activity needs to be investigated.

Further studies are needed to know the exact cause of fall in the paraoxonase activity in case of the pre-hypertensive hypertensive subjects compared to the normotensive controls as seen in the present study.

RESULTS

Forty seven (35%) and forty two (31.3%) participants were pre-hypertensive and hypertensive, respectively. Demographic characteristics of prehypertensives, hypertensives and controls have been discussed which includes age. (TABLE 1) of Mean Anthropometry Parameters ofstudy population is shown by (TABLE 2). Mean Haemodynamics in study population is shown by (TABLE3) Biochemical profile of study population is shown by (TABLE 4)

DISCUSSION

The role of enzyme paraoxonase in the reverse cholesterol transport is well known. It is also found that paraoxonase acts as an antioxidant by hydrolyzing phospholipid hydroperoxides and cholesterol ester hydroperoxides and reduces lipid hydroperoxides to respective hydroxides and also degrades H_2O_2.[6]

Table 1: Demographic Characteristics Of Study Population

S.No.	Variables	Prehypertensive(n=47)	Hypertensive(n=42)	Controls (n=45)
1	Age (in yrs)	42.52±8.74	54.10±8.16	32.96±6.12

Table 2: Mean Anthropometry Parameters in Study population

S.No.	Variables	Prehypertensive(n=47)	Hypertensive(n=42)	Controls (n=45)
1	Weight (kg)	71.23±5.95	72.17±6.36	67.57±7.39
2	Height (cm)	162.47±4.51	164.87±5.61	166.70±6.23
3	BMI (kg/m^2)	25.43±1.62	26.49±1.82	24.20±1.47
4	Waist-Hip ratio	0.92±0.02	0.93±0.03	0.91±0.02
5	Obesity (%)	65%	57%	61%

Table 3: Mean haemodynamics in study population

S.No.	Variables	Prehypertensive(n=47)	Hypertensive(n=42)	Controls (n=45)
1	SBP(mmHg)	128.46±6.04	164.5±13.6	118.7±4.89
2	DBP(mmHg)	83.26±3.06	94.20±6.11	77.67±5.94

Table 4: Biochemical Profile In Study Population

S.No.	Parameters	Controls (n=45)	Prehypertensive(n=47)	Hypertensive(n=42)
1	PON-1 (U/L)	364.5±9.8	339.6±6.4*	332.2±19.38*
2	Triglycerides (mg%)	124.3±6.0	138.3±7.4*	173.17±3.5*
3	Cholesterol (mg%)	167±8.6	180.4±9.8*	205.8±3.0*
4	HDL (mg%)	56.6±4.8	48.2±7.9*	38.8 ±5.3*
5	LDL (mg%)	105.2±2.5	113.2±2*	129±1.1*
6	VLDL (mg%)	21.8±5.7	25.2±4*	37.5±1.5*

(*p-value <0.001)

In the present study there was a significant difference in the paraoxonase activity between normotensive and prehypertensives women ($p<0.001$), similar significant ($p<0.001$) differences was also observed when comparison was done between normotensive and hypertensive women. Sarkar PD,Shivprakash T.M, Madhusudan B (2006)studied relationship between paraoxonase activity and lipid levels in ischemic stroke patients and found decreased PON & HDL concentration in ischemic patients compared to controls[7].Aymelek Gonenc (2012)[8] studied paraoxonase activity in hypertensive patients according to their study PON-1 activity were found at low level in patients with hypertension compared to controls ($p<0.01$).Our finding correlates with study done by Saxena T ,Agarwal B.K.,Sharma V.K.,Naz S,Lanke P (2013)that showed the increased oxidative stress and decreased paraoxonase activity in Pre HTN subjects[9]

Lipid profile parameters like total cholesterol,triglycerides,VLDL and VLDL were found increased significantly ($p<0.001$) while HDL levels were lowered significantly ($p<0.001$) in both pre-hypertensives women and hypertensive women as compared to normotensive women. M S Saha, N K Sana and Ranajit Kumar Shaha, (2006)[10] concluded that serum cholesterol; triglyceride and LDL-cholesterol levels are positively correlated with hypertensive patients whereas HDL-cholesterol has no significant changes with hypertension. The higher level of serum TC, TG and LDL-cholesterol in the study population may be due to genetic factors and increased consumption of dietary animal fat, lack of physical exercise, metabolic disorders like diabetes Mellitus and hypothyroidism, severe stress, increased age, sex as well as alcohol and tobacco consumption may also be the contributory factors for this phenomenon.M.R Akpa, C.T Tobin et al (2009)[11] determined the lipid profile in newly diagnosed hypertensive patients and compare them with age, sex and body mass index (BMI) of matched healthy non-hypertensive controls. Newly diagnosed hypertensives have significantly higher serum cholesterol levels than non-hypertensives of comparable age, sex and body size.

CONCLUSION

The present findings show that paraoxonase activity decrease in Prehypertensive and hypertensive women and lipid levels increases in both the cases group when compared to normotensive control group, which may eventually lead to atheroscelerosis and other high blood pressure related health problems. Further studies are necessary to delineate the factors involved in the disturbed regulation of the paraoxonase enzyme activities in these levels of blood pressure.

Estimation of serum paraoxonase activity is simple and inexpensive; it can be used to predict the development of atherosclerotic disease like coronary artery disease, cerebrovascular disease and renal complications associated with hypertension.

Serum paraoxonase activity estimation may also be helpful in assessing the usefulness of antihypertensive drugs in prevention of associated complications.

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