Role of ions, lipids, serum and urinary protein profile in developing hypertension.

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Received: June 19, 2005 Accepted: February 17, 2006

ABSTRACT

Objective: Study was conducted to observe the relationship of ions with lipid profile and protein content of hypertensive patients.

Methods: Lipid profile, ions and serum and urinary proteins were studied in patients with hypertension and compared with normal subjects.

Results: Serum cholesterol, triglyceride and LDL-chol were significantly increased, whereas the level of HDL-cholesterol was significantly decreased in patients as compared to their controls. Serum calcium was increased, whereas the level of serum magnesium was decreased as compared to control subjects. Serum protein level is non significantly decreased whereas serum albumin and urinary protein decreased significantly.

Conclusion: Beside lipid profile, there may be a role of ions like calcium and magnesium as well as of protein in hypertension. (Rawal Med J 2006;31:14-16)

Key Words: Lipid profile, ions, protein, hypertension.

INTRODUCTION

Hypertension is characterized by multiple alterations in the structure and function of the cell membrane. It is widespread in urban Pakistan, as one in 4 household has this condition and proportion of women is higher then men with one third having a family history. Dyslipidemia accompanying essential hypertension have been well noted. Alterations in plasma or membrane lipids are closely associated with ion transport abnormalities as well as with impaired control of cytosolic calcium and pH in various forms of hypertension. Such lipid-dependent modifications of membrane properties in cells participating in the cardiovascular regulation might be a part of pathogenetic mechanisms responsible for chronic blood pressure elevation. Patients with essential hypertension have widespread depression of cell membrane Na(+)-K(+)-ATPase and Ca(2+)-ATPase activities with plasma Ca2+ depletion and cytosolic Ca2+ overload, which may reflect an underlying membrane abnormality in essential hypertension. The cellular abnormalities may be related to the defective transport mechanisms that in turn may be aggravated by plasma Ca2+ depletion.

It has been observed that in patients with normal to high-normal pressure, sodium restriction lowered blood pressure to the optimal range and decreased proteinuria. UT-A urea transporter protein in heart was found increased during uremia, hypertension, and
heart failure. Some workers reported that the loss of negative charge allows protein, especially albumin to pass through the glomerular membrane with ease. It has been observed that efficiency of carbamoyl-phosphate synthetase (an enzyme of urea cycle) may contribute to the availability of precursors for nitric oxide synthesis. The precursor of nitric oxide is arginine, a urea cycle intermediate and it has been hypothesized that low concentration of arginine would correlate with the presence of persistent pulmonary hypertension. The aim was this study was to observe the relationship of ions, lipid profile, and serum and urinary protein content in patients with hypertension.

MATERIAL AND METHODS

The study subjects included 50 hypertensive females and 20 normal subjects (with no history of hypertension) with an age ranges 40-55 years. They were taken from the medical ward of Sir Ganga Ram Hospital, Lahore. Lipid profile (cholesterol, triglyceride, HDL-chol and LDL-chol), blood urea, serum creatinine, protein, albumin, calcium, magnesium and urinary proteins were analyzed by standard kit/flame photometer. Data was analyzed by using Student ‘t’ test. P value was considered as significant at P<0.01 and highly significant at P<0.001.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Patients</th>
<th>Control subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood pressure (mmHg)</td>
<td>160±2.56/100±10.8 (SD=90.2/25.5)</td>
<td>120.5±1.88/80.2±0.8 (SD=70.2/20.5)</td>
</tr>
<tr>
<td>Blood urea (mg/dl)</td>
<td>55.59±6.63 (SD=37.51)**</td>
<td>26.38±1.09 (SD=10.1)</td>
</tr>
<tr>
<td>S. Creatinine(mg/dl)</td>
<td>1.56±0.21 (SD=1.16)**</td>
<td>0.84±0.02(SD=0.95) **</td>
</tr>
<tr>
<td>S. Protein (g/dl)</td>
<td>6.60±0.19 (SD=1.00)</td>
<td>6.99±0.08(SD=1.4)</td>
</tr>
<tr>
<td>S. Albumin (g/dl)</td>
<td>3.66±0.18 (SD=0.85)**</td>
<td>4.60±0.02(SD=0.89) **</td>
</tr>
<tr>
<td>Urinary protein (g/dl)</td>
<td>0.75±0.17 (SD=0.58)**</td>
<td>0.13±0.01 (SD=0.02) **</td>
</tr>
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</table>

**P<0.001=Highly significant difference

RESULTS

The levels of blood urea and serum creatinine were increased in patients as compared to the control subjects (P<0.001). The level of serum albumin and urinary protein were significantly increased (P<0.001) in patients as compared to the control subjects. The level of serum calcium was slightly increased in patients as compared but it showed no significant difference. Serum magnesium was non-significantly decreased in patients as compared to the level of control subjects (table 1). The levels of cholesterol, triglyceride, and LDL-cholesterol were significantly increased (P<0.001) in patient as compared to their controls. On the other hand, level of HDL-cholesterol was significantly (P<0.001) low in patients (table 2).
Table 2. Lipid profile and ions in patients and control subjects

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Patients</th>
<th>Control subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol (mg/dl)</td>
<td>188.34±3.95**</td>
<td>170.84±2.58(SD=75.2)</td>
</tr>
<tr>
<td>Triglyceride (mg/dl)</td>
<td>204.96±4.86**</td>
<td>175.93±3.32(SD=69.1)</td>
</tr>
<tr>
<td>LDL-chol (mg/dl)</td>
<td>116.19±7.58**</td>
<td>93.79±2.53(SD=20.9)</td>
</tr>
<tr>
<td>HDL-chol (mg/dl)</td>
<td>38.21±1.36**</td>
<td>68.59±2.51(SD=10.2)</td>
</tr>
<tr>
<td>S.Calcium (mg/dl0)</td>
<td>9.11±0.39 (SD=1.48)</td>
<td>9.0±0.28(SD=1.1)</td>
</tr>
<tr>
<td>S.Magnesium (mg/dl)</td>
<td>1.86±0.12 (SD=0.45)</td>
<td>1.90±0.30(SD=1.4)</td>
</tr>
</tbody>
</table>

**P<0.001=Highly significant difference

**DISCUSSION**

Patients with hypertension showed increased serum cholesterol and its lipoprotein LDL-cholesterol as compared to control subjects. Results of present study is in accord to other studies11,12 where a role of lipid profile in developing hypertension was observed. Calcium was increased in patients as compared to the control subjects, whereas the level of magnesium was decreased, as observed by some workers.13

The renin-angiotensin system is an important element of the inter-related mechanism that regulate hemodynamics, water and electrolyte balance. In most cells stimulation of angiotensin II receptors lead to hydrolysis of phosphotidyl inositol 4,5 bi phosphated with generation of inositol 1,4,5 tri phosphate and diacylglycerol as 2nd messanger.12 The resultant increased in the intracellular concentration of calcium and activation of calcium calmodulin dependent myosin light chain kinase appear to account for the capacity of angiotensin II to contract smooth muscle. It has been observed14 that the factors like hypercalcemia and the rate of sodium reabsorption may influence magnesium reabsorption. Blood urea and serum creatinine were significantly increased in patients as compared to control subjects as has been observed.12 One of the intermediate of urea cycle arginine, which is precursor of nitric oxide, is known to play an important role in hypertension.15

Serum protein was decreased non-significantly in hypertensive subjects and may be secondary to excessive protein loss due to kidney damage. We also determined urinary protein and found that the level of was significantly increased in patients as compared to normal subjects as has been reported in another study.5 They also reported that sodium restriction decreased proteinuria. It is, therefore, concluded that beside lipid profile, there is a role of ions like calcium and magnesium as well as of protein in hypertension. Further studies are needed on large number of patients to define the role of these elements.

**REFERENCE**

1 Medical News. Hypertension in women. 2000;39:3
