Apelin and Visfatin Plasma Levels in Healthy Individuals With High Normal Blood Pressure

Cl Liakos,1 EA Sanidas,1 DN Perrea,1 V Gennimata,1 V Chantziara,1 CA Grassos,2 N-A Viniou,1 JD Barbetseas,1 and DP Papadopoulos1

1, 2 ESH Centers of Excellence for Hypertension, “Laiko” General Hospital & “KAT” General Hospital of Attica, Athens, Greece

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The relationship of BP with CV risk extends from high BP levels to relatively low values (110-115/70-75 mmHg), lower than those necessitating anti-hypertensive therapy.

High normal BP (130-139/85-89 mmHg) is related with increased CV risk compared to:
- normal BP (120-129/80-84 mm Hg) or/and
- optimal BP (<120/80 mm Hg).

Background

- **Adipose tissue** is no longer considered a triglyceride-storing depot but it is acknowledged as an endocrine organ that releases bioactive factors termed adipokines.

- **Novel adipokines** such as apelin and visfatin have been identified.

Background

- Low apelin plasma levels have been associated with arterial hypertension and atherosclerosis.
  

- High visfatin plasma levels may promote vascular inflammation & atherosclerotic plaque destabilization and have been evaluated as a marker for identifying stages of essential hypertension.
  

- Apelin and visfatin levels have not been thoroughly evaluated within the wide normal range of BP.
The present study:

- was conducted in apparently healthy, non-hypertensive, middle-aged individuals

and

- sought to compare the apelin and visfatin plasma levels between subjects with high normal BP and individuals with normal or optimal BP matched for age, gender, smoking and BMI.
Study population

Inclusion criteria:
- Apparently healthy, non-hypertensive adults who were referred to our outpatient hypertensive units.

Exclusion criteria:
- Arterial hypertension
- Diabetes mellitus
- Coronary artery disease
- Heart failure
- Atrial fibrillation
- Cerebrovascular events
- Malignancies
- Inflammatory diseases
- Thyroid abnormalities
- Renal or liver dysfunction
- Any medication
- Pregnancy
Study design

182 Examined

122 Excluded:
• 101 exclusion criteria
• 21 denied participation

60 Enrolled

25 High Normal BP

35 Normal or Optimal BP
Traditional CV risk factors:
- Total cholesterol (mg/dl)
- Triglycerides (mg/dl)
- HDL cholesterol (mg/dl)
- LDL cholesterol (mg/dl)
- Fasting plasma glucose (mg/dl)
- Serum creatinine (mg/dl)
- eGFR (ml/min/1.73 m²)

Adipokines:
- Apelin (pg/ml)
- Visfatin (ng/ml)
### Results - Clinical characteristics

#### Table 1 Clinical characteristics of the study population

<table>
<thead>
<tr>
<th>Clinical characteristics</th>
<th>High normal BP subjects (n = 25)</th>
<th>Normal or optimal BP subjects (n = 35)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>57 ± 4</td>
<td>55 ± 7</td>
<td>0.428</td>
</tr>
<tr>
<td>Male gender, n (%)</td>
<td>19 (76)</td>
<td>22 (63)</td>
<td>0.281</td>
</tr>
<tr>
<td>Office systolic BP (mm Hg)</td>
<td>136 ± 3</td>
<td>118 ± 2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Office diastolic BP (mm Hg)</td>
<td>88 ± 2</td>
<td>78 ± 2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Smoking, n (%)</td>
<td>8 (32)</td>
<td>10 (29)</td>
<td>0.775</td>
</tr>
<tr>
<td>Body mass index (kg/m2)</td>
<td>24.0 ± 1.7</td>
<td>23.2 ± 1.4</td>
<td>0.532</td>
</tr>
</tbody>
</table>

High normal BP, 130–139/85–89 mmHg; Normal BP, 120–129/80–84 mmHg; Optimal BP, <120/80 mmHg.
### Results - Laboratory CV risk factors

#### Table 2 Laboratory CV risk factors of the study population

<table>
<thead>
<tr>
<th>Laboratory CV RFs</th>
<th>High normal BP subjects (n = 25)</th>
<th>Normal or optimal BP subjects (n = 35)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cholesterol (mg/dl)</td>
<td>222 ± 15</td>
<td>220 ± 13</td>
<td>0.725</td>
</tr>
<tr>
<td>Triglycerides (mg/dl)</td>
<td>106 ± 12</td>
<td>102 ± 11</td>
<td>0.712</td>
</tr>
<tr>
<td>HDL cholesterol (mg/dl)</td>
<td>46 ± 4</td>
<td>48 ± 4</td>
<td>0.487</td>
</tr>
<tr>
<td>LDL cholesterol (mg/dl)</td>
<td>138 ± 25</td>
<td>135 ± 24</td>
<td>0.525</td>
</tr>
<tr>
<td>Fasting plasma glucose (mg/dl)</td>
<td>95 ± 9</td>
<td>94 ± 8</td>
<td>0.868</td>
</tr>
<tr>
<td>Serum creatinine (mg/dl)</td>
<td>0.92 ± 0.28</td>
<td>0.90 ± 0.22</td>
<td>0.614</td>
</tr>
<tr>
<td>eGFR (ml/min/1.73 m2)</td>
<td>106 ± 28</td>
<td>109 ± 30</td>
<td>0.569</td>
</tr>
</tbody>
</table>

*High normal BP, 130–139/85–89 mmHg; Normal BP, 120–129/80–84 mmHg; Optimal BP, <120/80 mmHg.*
### Results - Adipokines

<table>
<thead>
<tr>
<th>Adipokines</th>
<th>High normal BP subjects (n = 25)</th>
<th>Normal or optimal BP subjects (n = 35)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apelin (pg/ml)</td>
<td>205 ± 108</td>
<td>325 ± 152</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Visfatin (ng/ml)</td>
<td>11.0 ± 2.0</td>
<td>7.2 ± 0.9</td>
<td>0.002</td>
</tr>
</tbody>
</table>

High normal BP, 130–139/85–89 mmHg; Normal BP, 120–129/80–84 mmHg; Optimal BP, <120/80 mmHg.
Results - Adipokines

- Adipokines

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Results - Adipokines

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Conclusions

• The present study suggests the hypothesis that in the absence of major CV risk factors, persons with high normal BP have decreased apelin and increased visfatin plasma levels compared to their peers with normal or optimal BP.

• Normal office BP levels seem to bear a negative relation to apelin and a positive association to visfatin plasma levels. These correlations are independent of age, gender, smoking, BMI, renal function, and glycemic & lipid status.

• Theses findings might partially explain the higher CV risk of high normal BP subjects.
Limitations

• Small **number** of **participants**.

• **Insulin resistance**, a factor known to be related with adipokines plasma levels (especially apelin), was not assessed. However, participants were not diabetic.

• **Dipping pattern, dietary habits** (including the **salt intake**), **physical activity level** and **seasonal effects** on BP levels were not taken into account.
BRIEF COMMUNICATION

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Charalampos I. Liakos,1 Elias A. Sanidas,1 Despoina N. Perrea,2 Charalampos A. Grassos,3 Vasiliki Chantziara,1 Nora-Athina Viniou,1 John D. Barbetseas,1 and Dimitrios P. Papadopoulos1

Correspondence: Charalampos I. Liakos (bliakos@med.uoa.gr).

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1ESH Center of Excellence for Hypertension, “Laiko” General Hospital, Athens, Greece; 2Department of Experimental Surgery and Surgical Research “NS Christeas,” Athens School of Medicine, Athens, Greece; 3ESH Center of Excellence for Hypertension, “KAT” General Hospital of Attica, Athens, Greece.

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