Vitamin D, central blood pressure, arterial stiffness and intima-media thickness in children and adolescents with primary hypertension

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Introduction

The relationship between vitamin D status and cardiovascular risk has been thoroughly studied in recent years. Experimental studies indicate that vitamin D deficiency may contribute to blood pressure elevation, activation of renin-angiotensin-aldosterone system, generation of reactive oxygen species with resulting endothelial dysfunction. In observational studies an inverse relation between vitamin D status and arterial hypertension was found but interventional trials have not confirmed impact of vitamin D supplementation on reducing cardiovascular risk. There are only single studies on vitamin D in pediatric patients with hypertension. Pludowski et al. did not find differences in vitamin D status between children with prehypertension, hypertension stage 1, and stage 2. Also these authors did not find relation between vitamin D and carotid intima media thickness and left ventricular mass (J Steroid Biochem Mol Biol 2014, New Eng J Med 2019).

Aim

Aim of the study to assess relation between calcium-phosphorus metabolism including vitamin D status, peripheral and central blood pressure and arterial damage in pediatric patients with primary hypertension (PH).

Study group: 71 children with primary hypertension

Control group: 30 healthy children

Clinical data, blood pressure, arterial parameters, and biochemical data:
- Age [years], gender, duration of hypertension [months], BMI [kg/m²] Z-score, medications used
- Peripheral blood pressure: systolic and diastolic blood pressure [mm Hg], Z-score (Welch Allyn VSM Patient Monitor 300)
- Aortic systolic, diastolic and mean blood pressure (AoSBP, AoDBP, AoMAP) [mm Hg], augmentation index corrected for heart rate 75 bpm (Alx75HR [%]), SEVR (subendocardial viability ratio [%]), pulse wave velocity (PWV) [m/s], [Z-score] (Sphygmocor)
- Common carotid arteries intima-media thickness (cIMT) [mm], [Z-score] (ALOKA ProSound Alpha 6)
- ABPM: systolic, diastolic, mean blood pressure (SBP, DBP, MAP) [mm Hg], Z-score, SBP/DBP load [%], heart rate [bpm], BP variability (standard deviation), BP dipping [%], ambulatory arterial stiffness index [AASI] (SUNTECH OSCAR 2)
- GFR [mL/min/1.73m²], uric acid [mg/dL], calcium [mg/dL], phosphorus [mg/dL], Ca²⁺ [mg/dL²], parathormone [pg/mL], vitamin D [ng/mL], alkaline phosphatase [IU/L], total, LDL, HDL-cholesterol [mg/dL], triglycerides [mg/dL]

Statistical analysis: Dell Statistica 13.0 PL. Variables were presented as the mean±SD. Following tests were used: Shapiro-Wilk Test, Student t-test, U Mann-Whitney test, Pearson linear correlation, Spearman rank correlation, Fisher’s exact test, general regression model. A p-value <0.05 was considered statistically significant.

Results

Parameter

<table>
<thead>
<tr>
<th>Primary hypertension</th>
<th>Control group</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients (n)</td>
<td>14.88±2.88</td>
<td>14.80±2.12</td>
</tr>
<tr>
<td>Age (years)</td>
<td>47/24</td>
<td>11/19</td>
</tr>
<tr>
<td>Sex (boys/girls)</td>
<td>1.03±0.89</td>
<td>0.27±0.87</td>
</tr>
<tr>
<td>BMI [kg/m²]</td>
<td>2.16±1.08</td>
<td>0.17±0.85</td>
</tr>
<tr>
<td>Office SBP [mm Hg]</td>
<td>1.41±0.92</td>
<td>-0.05±0.57</td>
</tr>
<tr>
<td>Office DBP [mm Hg]</td>
<td>34 (47.9%)</td>
<td>-</td>
</tr>
<tr>
<td>Antihypertensives</td>
<td>19.86±6.29</td>
<td>21.40±8.26</td>
</tr>
<tr>
<td>Vitamin D [mg/mL]</td>
<td>10.04±0.35</td>
<td>10.00±0.35</td>
</tr>
<tr>
<td>Calcium [mg/dL]</td>
<td>4.38±0.70</td>
<td>4.26±0.45</td>
</tr>
<tr>
<td>Phosphorus [mg/dL]</td>
<td>43.31±0.93</td>
<td>42.55±1.14</td>
</tr>
<tr>
<td>Ca²⁺ [mg/dL²]</td>
<td>29.35±25.95</td>
<td>26.59±12.83</td>
</tr>
<tr>
<td>IPHT [pg/mL]</td>
<td>121.97±55.56</td>
<td>150.72±83.01</td>
</tr>
<tr>
<td>ALP [IU/L]</td>
<td>99.15±19.73</td>
<td>101.29±17.70</td>
</tr>
<tr>
<td>GFR [mL/min/1.73m²]</td>
<td>6.96±14.40</td>
<td>65.69±28.09</td>
</tr>
<tr>
<td>Uric acid [mg/dL]</td>
<td>105.09±19.65</td>
<td>91.88±6.55</td>
</tr>
<tr>
<td>Cholesterol [mg/dL]</td>
<td>79.23±10.40</td>
<td>65.80±6.74</td>
</tr>
<tr>
<td>APOA1 [mg/dL]</td>
<td>93.54±19.65</td>
<td>78.76±6.77</td>
</tr>
<tr>
<td>APOB [mg/dL]</td>
<td>29.86±65.95</td>
<td>26.07±41.51</td>
</tr>
<tr>
<td>APOA1/AR [mg/dL]</td>
<td>-2.85±14.18</td>
<td>-3.75±7.50</td>
</tr>
<tr>
<td>PWV [m/s]</td>
<td>5.07±0.82</td>
<td>4.43±0.63</td>
</tr>
<tr>
<td>PWV Z-score</td>
<td>-0.22±1.61</td>
<td>-1.26±1.02</td>
</tr>
<tr>
<td>cIMT [mm]</td>
<td>0.47±0.08</td>
<td>0.42±0.04</td>
</tr>
<tr>
<td>cIMT Z-score</td>
<td>1.67±1.59</td>
<td>0.61±0.88</td>
</tr>
</tbody>
</table>

In multivariate analysis significant predictors of arterial damage were: MAP24h Z-score for PWV Z-score (R=0.35, 95%CI: 0.05–0.64), BMI Z-score for Alx75HR (R=0.49, 95%CI: 0.14–0.84), and vitamin D for cIMT Z-score (R=0.33, 95%CI: 0.07–0.59).

Conclusions: Vitamin D status does not seem to influence directly peripheral and central blood pressure or arterial stiffness in children with primary hypertension and in healthy pediatric patients. The non-intuitive and surprising positive relation between vitamin D status and carotid intima-media thickness in pediatric patients with primary hypertension requires further examinations.
Markers of endothelial injury in children and adolescents with primary hypertension

Piotr Skrzypczyk¹, Anna Ozimek¹, Anna Ofiara², Michał Szyszka², Jarosław Sołtyski¹, Anna Stelmaszczyk-Emmel³, Elżbieta Górska³, Małgorzata Pańczyk-Tomaszewska¹

Introduction

Primary hypertension (PH) is a dominant form of hypertension in teenagers and its incidence in children and adolescents is at constant rise as a consequence of increasing prevalence of obesity and excessive salt intake. Arterial hypertension causes shear stress to endothelial cells leading to their activation and dysfunction. E-selectin and ICAM-1 are adhesion molecules, produced almost exclusively by activated endothelial cells. E-selectin mediates leukocyte rolling on the endothelium and platelet-leukocyte interaction, whereas ICAM-1 is a molecule responsible for leukocyte migration into subendothelial layers of vascular wall. ICAM-1 concentration was found to be linked to future incidence of coronary heart disease and E-selectin correlation was strongly related to traditional cardiovascular risk factors. (Pediatr Nephrol 2016; 3: 185-194, Thromb Haemost 2006; 95: 134–141)

Aim

Aim of the study was to assess relation between E-selectin and ICAM-1 and clinical and biochemical parameters including ambulatory blood pressure monitoring (ABPM) in children and adolescents with PH.

Patients and methods

Statistical analysis

Dell Statistica 13.0 PL software (Dell Inc., Aliso Viejo, CA, USA). Variables were presented as the means±SD and IQR. Following tests were used: Shapiro-Wilk test, Student t-test, U Mann-Whitney test, Pearson linear correlation, Spearman rank correlation, Fisher’s exact test. Multivariate analysis was performed using general regression model. A p-value <0.05 was considered statistically significant.

Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age [years]</td>
<td>15.04±2.62 (13.83 – 17.08)</td>
</tr>
<tr>
<td>Sex [boys/girls]</td>
<td>50/27 (64.9%/35.1%)</td>
</tr>
<tr>
<td>BMI [kg/m²]</td>
<td>24.99±5.14 (21.64 – 27.47)</td>
</tr>
<tr>
<td>BMI Z-score</td>
<td>0.99±0.99 (0.44 – 1.62)</td>
</tr>
<tr>
<td>MAP24h [mm Hg]</td>
<td>134±21±13±3 (124–145)</td>
</tr>
<tr>
<td>DBP [mm Hg]</td>
<td>80.53±10.26 (74–87)</td>
</tr>
<tr>
<td>Antihypertensives</td>
<td>33 (42.9%)</td>
</tr>
<tr>
<td>Non-pharmacol.</td>
<td>17 (22.0%)</td>
</tr>
<tr>
<td>Newly diagnosed</td>
<td>27 (35.1%)</td>
</tr>
<tr>
<td>E-selectin [ng/mL]</td>
<td>55.63±26.49 (36.22 – 69.57)</td>
</tr>
<tr>
<td>ICAM-1 [ng/mL]</td>
<td>302.17±67.14 (259.3–328.0)</td>
</tr>
<tr>
<td>GFR [mL/min/1.73m²]</td>
<td>97.62±18.46 (84.32 – 108.36)</td>
</tr>
<tr>
<td>Uric acid [mg/dL]</td>
<td>5.85±1.49 (4.8 – 6.9)</td>
</tr>
<tr>
<td>Cholesterol [mg/dL]</td>
<td>159.79±39.29 (128 – 177)</td>
</tr>
<tr>
<td>Triglycerides [mg/dL]</td>
<td>101.86±68.23 (68 – 122)</td>
</tr>
<tr>
<td>SBP24h [mm Hg]</td>
<td>128.17±11.03 (118 – 136)</td>
</tr>
<tr>
<td>DBP24h [mm Hg]</td>
<td>70.84±7.43 (65 – 76)</td>
</tr>
<tr>
<td>MAP24h Z-score</td>
<td>1.12±1.44 (0.03 – 1.84)</td>
</tr>
<tr>
<td>SBP variability</td>
<td>13.14±2.73 (11.2 – 14.6)</td>
</tr>
<tr>
<td>DBP variability</td>
<td>11.16±3.10 (9.5 – 12.4)</td>
</tr>
<tr>
<td>AASI</td>
<td>0.38±0.12 (0.30 – 0.45)</td>
</tr>
</tbody>
</table>

Clinical data, blood pressure and biochemical data:

- **Age** [years], gender, duration of hypertension [months], BMI [kg/m²] Z-score, medications used
- **Peripheral oscillometric blood pressure** (Welch Allyn VSM Patient Monitor 300):
  - systolic and diastolic blood pressure [mm Hg], Z-score
  - **ABPM** (SUNTECH OSCAR 2): systolic, diastolic, mean blood pressure [SBP, DBP, MAP] [mm Hg], MAP Z-score, SBP/DBP load [%], heart rate [bpm], BP variability (standard deviation), BP dipping [%], ambulatory arterial stiffness index [AAI]
- **Glomerular filtration rate** (GFR) ac. to Schwartz formula [mL/min/1.73m²], uric acid [mg/dL], platelet-to-lymphocyte ratio (PLR), neutrophil-to-lymphocyte ratio (NLR), mean platelet volume (MPV) [FL], calcium [mg/dL], phosphorus [mg/dL], Ca²⁺ P [mg/dL], parathormone [pg/mL], vitamin D [mg/mL], alkaline phosphatase (ALP) [IU/L], total, LDL-, HDL-cholesterol [mg/dL], triglycerides [mg/dL]

Subgroups of patients did not differ in E-selectin and ICAM-1:

<table>
<thead>
<tr>
<th>Markers of endothelial injury</th>
<th>E-selectin [mg/mL]</th>
<th>ICAM-1 [ng/mL]</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI Z-score</td>
<td>R = 0.29, p = 0.011</td>
<td>R = 0.24, p = 0.037</td>
</tr>
<tr>
<td>Uric acid [mg/dL]</td>
<td>R = 0.35, p = 0.003</td>
<td>R = 0.17, p = 0.148</td>
</tr>
<tr>
<td>HDL-chool. [mg/dL]</td>
<td>R = -0.28, p = 0.020</td>
<td>R = -0.09, p = 0.475</td>
</tr>
<tr>
<td>ALP [IU/L]</td>
<td>R = 0.39, p = 0.001</td>
<td>R = 0.20, p = 0.086</td>
</tr>
<tr>
<td>PLR</td>
<td>R = 0.26, p = 0.025</td>
<td>R = 0.95, p = 0.062</td>
</tr>
<tr>
<td>SBP variability</td>
<td>R = 0.24, p = 0.037</td>
<td>R = 0.03, p = 0.825</td>
</tr>
<tr>
<td>DBP variability</td>
<td>R = 0.24, p = 0.038</td>
<td>R = 0.06, p = 0.586</td>
</tr>
</tbody>
</table>

In multivariate analysis the only significant predictors of markers of endothelial injury were:

- **MAP24h Z-score for E-selectin** (R=0.329, 95%CI: 0.012–0.646, p=0.042)
- **Uric acid for ICAM-1** (R=0.430, 95%CI: 0.040-0.819, p=0.031).

CONCLUSIONS: In children with PH endothelial damage is related primarily to mean arterial pressure and uric acid. Obesity, dyslipidemia, increased blood pressure variability and degree of subclinical inflammation may also be predisposing factors. Disturbed circadian blood pressure profile may be consequence of endothelial damage in untreated children with PH. E-selectin may be a marker of arterial stiffness in children with PH.
How BMI and WC reduction influence changes in blood pressure in overweight and obese children?

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Background

Studies focusing on the long-term behavioral programmes showed that by lowering the BMI percentile in children to a lower body mass category (from obesity to overweight or from overweight to normal body mass), the results of both systolic and diastolic arterial blood pressure have improved. Though, some studies pointed changes in waist circumference as crucial in reducing blood pressure in children.

Aim of the study

In the study we verified how changes in body mass percentile and waist circumference percentile affect the blood pressure in the group of children and adolescents participating in an annual integrated weight-loss intervention programme.
Presented data were collected in the "6-10-14 for Health" programme, run in Gdańsk, Poland.

**Data**

**Time period**: 2011 - 2016

**Location**: Gdańsk, Poland

**Population**: 1156 children with excess body weight aged 5-16

**Data source**: Programme "6-10-14 for Health"

**Tools**: Automated oscillometer validated for the use in children, used with adjusted circumference cuff

**Methods**: 3 measurement at every from 4 visits, done by pediatrician in the outpatient clinic

<table>
<thead>
<tr>
<th></th>
<th>6-8 years</th>
<th>9-12 years</th>
<th>13-15 years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls</td>
<td>179</td>
<td>249</td>
<td>139</td>
<td>567</td>
</tr>
<tr>
<td>Boys</td>
<td>164</td>
<td>280</td>
<td>145</td>
<td>589</td>
</tr>
<tr>
<td>Total</td>
<td>343</td>
<td>529</td>
<td>284</td>
<td>115</td>
</tr>
</tbody>
</table>
Methods

We have compared the data collected at the first visit in the programme with those form the last, fourth visit after a year of participation. The data included:

- Systolic and diastolic blood pressure,
- BMI,
- Waist circumference.

All the data were calculated first to the percentiles, according to the current polish percentile charts, and then to the z-score values.

The analyses were conducted using the general linear model (combining the advantages of the analysis of variance and regression) with the within-subject variation, in the SAS program.

BMI percentile values based on:
Kułaga Z., Percentile charts of height, body mass and body mass index in children and adolescents in Poland – results of the OLAF study, Medical Standards 2010, 7:690-700.

Blood pressure percentile values based on:

Waist circumference percentile values based on:
Świąder-Leśniak A., Kułaga Z., Grajda A., at al.: References for waist and hip circumferences in Polish children and adolescents 3-18 year of age, Medical Standards/Pediatrie 2015, 12:137-150.
## Results

Table 1: Change in z-score of systolic blood pressure, depending on changes in BMI and waist circumference

| Parameter | Estimate change in systolic blood pressure | Standard Error | t Value | Pr > |t| |
|-----------|------------------------------------------|----------------|---------|------|---|
| change of 1 z-score in BMI | 0.548 | 0.0920 | 5.95 | <.0001 |
| change of 1 z-score in waist circumference | 0.136 | 0.0638 | 2.13 | 0.0331 |

Table 2: Change in z-score of diastolic blood pressure depending on changes in BMI and waist circumference

| Parameter | Estimate change in diastolic blood pressure | Standard Error | t Value | Pr > |t| |
|-----------|-------------------------------------------|----------------|---------|------|---|
| change of 1 z-score in BMI | 0.528 | 0.099 | 5.32 | <.0001 |
| change of 1 z-score in waist circumference | 0.147 | 0.069 | 2.14 | 0.0321 |
Conclusions

1. Decrease of 1 z-score in BMI results in decrease of 0.55 z-score in systolic blood pressure (p<0.0001) and 0.53 z-score in diastolic blood pressure (p<0.0001). Changes in z-score of waist circumference had lower and less significant impact in both systolic and diastolic blood pressure (0.14 and 0.15; p>0.01).

2. The results indicated the crucial role of reduction in BMI z-score in diminishing both systolic and diastolic blood pressure in children and adolescents.

3. BMI centile should be considered as more important and adequate parameter affecting changes in blood pressure in child waist circumference.
The concept of a web-based calculator for supporting hypertension diagnostics among children and adolescents

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The concept of a web-based calculator for supporting hypertension diagnostics among children and adolescents

Background: Reliable diagnosis of hypertension (HT) both in adults and children requires correct measurements and interpretation of blood pressure (BP). In pediatric patients, diagnosis is particularly complex and the methodological requirements are often difficult to meet.

User-friendly tools to identify elevated BP in children

- Simple regression formulas/equations e.g. by Somu & others, or HBPi
- Simple tables e.g. AAP (for 5th pHt)
- New Indexes e.g. BPHtR
- Calculators/ICT e.g. MdCalc®

Normative BP tables

User-friendly/screening tools
The concept of a web-based calculator for supporting hypertension diagnostics among children and adolescents

**Aim:** The study presents the concept of an interactive calculator supporting the correct interpretation and classification of the office BP measurements in pediatric patients.

**Project Elements:** The calculator consists of three basic blocks:

1. **ANTROP block**
   - Analyzes the introduced anthropometric features (Ht, body weight, WC and mid-arm circumference MAC).
   - The block enables the assessment of Ht percentile and interpret of BMI and WHtR indices.

2. **BP INFO block**
   - Contains basic info related to the correct BP measurements divided into three sections:
     - BP Monitor/D EVICE ,
     - PATIENT,
     - OBSERVER

3. **MEASUREMENTS BP & CLASS block**
   - Interprets and classifies the entered BP values. It enables:
     - input of three series of BP measurements,
     - selection of different reference criteria
     1. **PL** - Litwin M et al. Arterial Hypertens. 2018
     2. **ESH** - Lurbe E et al. Journal of Hypertension 201
     - visualization of the BP normative table fragment with regard to sex, age and percentile Ht category.
The concept of a web-based calculator for supporting hypertension diagnostics among children and adolescents

Project Elements: View of the main pediatric window of the BP calculator
The concept of a web-based calculator for supporting hypertension diagnostics among children and adolescents

Examples: Interpretation of BP measurements during a single visit

A/ 10 year old boy: Htcat = 75 percentile; Gradual normalization of subsequent BP measurements

B/ Interpretation of BP measurements with the use of various diagnostic criteria (2016-ESH, 2017-AAP and 2018-PL)
Final remarks:
The study presents the concept of an interactive calculator for supporting HT diagnostics in pediatric patients. Developed calculator has several advantages:

(i) improves the BP measurements methodology,
(ii) it includes a wider range of local and international HT definitions,
(iii) it interprets BP measurements based on the original normative tables recommended by leading scientific societies.
(iv) it can be easily modified and updated.

New ICT (web tools) can be helpful in improving the diagnosis and monitoring of HT in children. The presented tool can also be used for educational purposes.

The current version of the calculator can be easily extended to a registered version that will allow a history of measurements to be saved in a database.
Influence of risk factors of cardiovascular diseases upon essential hypertension formation and target organs lesion in adolescents

Plotnikova I.V., Dzhaffarova O.Yu., Svintsova L.I.
Cardiology Research Institute NRMC, Russia
**Aim of study:** to study the frequency of risk factors (RF) of cardiovascular diseases (CVD) in adolescents with essential hypertension and to assess their influence upon the target organs lesions.

**RF study** included the assessment of frequency of passive and active smoking, low physical activity, hereditary CVD and overweight. **Left ventricle function** was assessed according to Echo.

**Characteristics of the investigated object**

326 youths at the age of 12 - 18 years old. The average age of the investigated patients is 14,9 ± 2,0 years old.

The frequency of main CVD risk factors in adolescents with essential arterial hypertension

The influence of CVD risk factors upon stable essential AH in adolescents

Notice: CVD – cardiovascular disease; WCH – «white coat hypertension» phenomenon; LAH – liable arterial hypertension; st.AH – stable arterial hypertension
The frequency of structural-geometric changes of left ventricle myocardium in adolescents with essential arterial hypertension.

The frequency of structural-geometric changes of left ventricle myocardium at different stages of essential arterial hypertension at formation in adolescents.

Relation of cardiovascular disease risk factors and target organs lesions with essential arterial hypertension in adolescents

- Burdened heredity for idiopathic hypertension
- Smoking
  - Pulse blood pressure level
- Vessels
  - Lesions of endothelium
  - Endothelium dysfunction
- Heart
  - Changes of left ventricle myocardium geometry
- Overweight
  - Triglycerides level
  - Time index of diastolic blood pressure per night
  - Average blood pressure per day
- Insulin resistance
- Average blood pressure per day
Conclusion: smoking, overweight and hereditary for idiopathic hypertension favour increase of chance formation of stable arterial hypertension and target organs lesions in adolescents with essential arterial hypertension.
Markers of endothelial dysfunction in youths with essential arterial hypertension

Plotnikova I.V., Dzhaffarova O.Yu., Svintsova L.I.
Cardiology Research Institute NRMC, Russia
Aim of study

We aimed to assess laboratory findings of endothelial dysfunction in children with essential arterial hypertension and correlate them with risk factors of cardiovascular diseases, data of daily blood pressure monitor, structural brain abnormalities.

Characteristics of the investigated object

326 youths at the age of 12 - 18 years old. The average age of the investigated patients is 14,9± 2,0 years old.

Notice: WCH – «white coat hypertension» phenomenon;
LAH – liable arterial hypertension;
st. AH – stable arterial hypertension
Average values of von Willebrand factor level in the study groups and in the control group and its clinical difference in the given groups in respect of control with correct for sex and age


Notice: vWF – von Willebrand factor
Correlation of risk factors of cardiovascular diseases formation and level of pulse blood pressure with level of von Willebrand factor taking into consideration sex and age

- Increase of vWF on 1 unit (%) is followed by average figures of blood pressure level increased at night by 0.36 mm Hg (p=0.048).

Notice: vWF – von Willebrand factor, HD – hypertonic disease
Typical visual MRT manifestations of hypertensive encephalopathy

Patient P. 17 years old
Stable AH, Moderate manifestations of HE

Patient S. 16 years old
Liable AH, Minimal manifestations of HE

vWF level in the adolescent group with hypertensive encephalopathy (HE) was significantly higher than in the group of patients without structural brain disturbances by 18.83% (95%CI 2.39:35.28), p=0.025.
Conclusion: signs of disturbance of endothelia function are present at adolescence. Von Willebrand factor can be considered as a verified marker of endothelial dysfunction at early stages of essential AH formation.
MEASUREMENT OF SYSTOLIC BLOOD PRESSURE AT HOME BY PARENTS USING HAND-HELD DOPPLER DEVICE AND ANEROID SPHYGMOMANOMETER: A SINGLE CENTRE EXPERIENCE

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3 Kings College London, St Thomas NHS UK

INTRODUCTION:
• There are limited data regarding the clinical use of home BP monitoring in infants, children and young people unable to tolerate 24-hour ambulatory BP monitoring (ABPM)1-2.
• We taught parents to perform Doppler assisted systolic BP monitoring at home (HDBPM) using an aneroid sphygmomanometer.

METHODS:
• Retrospective review over 5-years of children referred to our tertiary hypertension service for whom parents performed HDBPM.
• During a planned hospital appointment, parents were taught to perform HDBPM. They performed monitoring over at least two weeks with three measurements in quick succession twice a day.

RESULTS:
• 116 children underwent HDBPM with median (IQR) age, 2.25 (0.83 – 4.9) years [Figure: 1].
• HDBPM was used as children were too young (n=80, 69%) or thought unlikely to tolerate ABPM (n=36, 31%) because of underlying learning difficulties, neurological disease or similar condition.
• Children had been referred to our service for confirming hypertension (52%, n=60) [Figure: 2] or for ongoing monitoring (48%, n=56) for those on anti-hypertensive therapy [Figure: 3].
• None of the children required admission to hospital for management of their hypertension.

CONCLUSION:
• In those unable to tolerate or too young to have 24-hour ABPM, we demonstrate Doppler device assisted BP measurement by parents is feasible.
• 90% of those referred with hypertension were identified to be normotensive following HDBPM and in a further 33% with confirmed hypertension, medication changes were made.
• We conclude that HDBPM is a clinically useful out-of-office BP measurement technique in this diverse and challenging group of children.

REFERENCES:
ADVANCED GLYCATION ENDPRODUCTS IN CHILDREN WITH PRIMARY & SECONDARY HYPERTENSION

Katarína Prochotská, Ľudmila Podracká
National Institute of Children’s Health
Bratislava, Slovakia
"ADVANCED GLYCATION ENDPRODUCTS" (AGEs)

• proteins or lipids that become glycated after exposure to sugars, formed in presence of:
  • hyperglycemia
  • high levels of oxidative stress (CKD)

  stiffening of the vessel wall
  predictor of cardiovascular mortality

DETECTION

• AGEs have characteristic autofluorescent properties
• non-invasive measurement through the skin
PATIENTS

70 children with hypertension - mean age 14.9 years (0.16 - 18 yrs) - 41 had antihypertensive treatment

Primary HTN
Secondary HTN

19 children
51 children

Mean carotid intima media thickness (cIMT) was 0.43 mm (0.30 - 0.69 mm) - 20% obese
RESULTS

$\text{creatinine}$

$\text{cIMT l.dx}$

$p = 0,03; r = 0,28$

$p = 0,014;$
CONCLUSION

• Children with secondary hypertension have significantly higher AGEs corrected for body surface area than children with primary hypertension, even if they are more obese (SDS BMI 5.2 vs 0.24)

• Simple, noninvasive assessment of AGEs accumulation may be used for fast screening or monitoring in children with hypertension.
Cardiogenic shock as a manifestation of critical renal artery stenosis in a 10-month-old infant

Piotr Wieniawski1, Piotr Skrzypczyk2, Michał Brzewski3, Małgorzata Pańczyk-Tomaszewska2, Bożena Werner1

1 – Department of Pediatric Cardiology and General Pediatrics, Medical University of Warsaw
2 – Department of Pediatrics and Nephrology, Medical University of Warsaw
3 – Department of Pediatric Radiology, Medical University of Warsaw

Introduction:
Hypertensive crisis in infants is an extremely rare medical emergency requiring prompt treatment to prevent target-organ damage and even death.

Case report:
10-month-old boy with a respiratory tract infection due to increasing dyspnea and worsening of general condition was intubated and transferred to intensive care unit.

Structural heart defects including anomalous origin of the left coronary artery were excluded based on ECHO and angio-CT. In magnetic resonance no signs of myocarditis were found and dilated cardiomyopathy was diagnosed.

Decreased radionuclide uptake by right kidney was found in renal scintigraphy (34% vs. 66%).

After numerous multidisciplinary consultations, due to technical inability to perform PTRA or surgical revascularization, the child was qualified to right-sided nephrectomy.

Conclusions:
1. Hypertensive crisis in infants may manifest as cardiogenic shock.
2. Dilated cardiomyopathy can be secondary to severe arterial hypertension, even in infancy.
3. In every case of hypertensive crisis in children thorough diagnostic approach is necessary to exclude renal artery stenosis.
Simplified BP-for-height charts to identify high blood pressure by AAP guidelines

Cynthia S Bell, MS and Joshua A Samuels, MD, MPH

Division of Pediatric Nephrology & Hypertension
McGovern Medical School at UTHealth
Houston, Texas, USA
Background

- 2017 American Academy of Pediatrics (AAP) clinical practice guideline for blood pressure in children created new normative thresholds
  - Excludes overweight children
  - Streamlines thresholds for older children
  - Normative tables remain cumbersome for accurate clinical use
    - Studies have demonstrated incorrect threshold selection in up to 87% of children with elevated blood pressure going unidentified by providers

AAP guidelines include a simplified table of thresholds by age

However, blood pressure in childhood physiologically correlates more with height
Goals & Methods

• Create sex-specific BP-for-height charts to facilitate evaluation of abnormally elevated pressure in children

• Similar in style to ubiquitous growth charts used globally

• 2017 AAP threshold values directly from the published tables in children <13 years

• Maximize sensitivity and minimize false negative diagnoses by plotting the lowest threshold across all ages for each height percentile category

• Ensure no threshold exceeds 13+ cutoffs
  • 120/80 for Elevated BP
  • 130/80 for Stage 1 Hypertension
  • 140/90 for Stage 2 Hypertension
BP-for-height chart

*Systolic*

Female <13 years
- Stage 1
- Elevated
- Stage 2

Male <13 years
- Stage 1
- Elevated
- Stage 2

SBP in mmHg vs Height in cm

Simplified BP-for-height charts to identify high blood pressure by AAP guidelines.
BP-for-height chart

Diastolic

Simplified BP-for-height charts to identify high blood pressure by AAP guidelines.
BP-for-height chart

Systolic & Diastolic

Simplified BP-for-height charts to identify high blood pressure by AAP guidelines

Female <13 years

Male <13 years

Female <13 years

Male <13 years

--- dashed lines indicate thresholds for ≥13 years
Conclusions

• Useful as a first line screening tool for blood pressure evaluation in children throughout the world
  • Among 446 healthy 10-12 year old males and females screened for high blood pressure
    • **100% sensitivity** for detection of elevated SBP or DBP
    • **94% specificity** for elevated SBP and 99% specificity for elevated DBP

• No false negatives: All children with elevated BP were identified

• 25 SBP and 6 DBP false positives would require **reclassification** by AAP tables
Nocturnal Dipping - is it Normal in Prehypertensive Children and Adolescents?


University Children's Hospital Zagreb, Zagreb, Croatia (1)
Introduction:

- The nocturnal dipping pattern in prehypertensive children and adolescents has not been studied well. Decreased dipping in nocturnal blood pressure in children and adolescents is related to secondary hypertension, obesity, obstructive sleep apnea, low birth weight, diabetes mellitus type 1 and type 2. Obesity is often associated with primary arterial hypertension and prehypertension in children and adolescents and affects not only average 24-hour BP values, but also decreases drop in nocturnal BP. Prehypertension is defined as blood pressure (BP) ≥90th percentile, or ≥120/80 mmHg, but < 95th percentile for age, sex and height.

- The aim of our study was to investigate the nocturnal drop in blood pressure in patients with prehypertension.
Subjects and methods:

• We studied 24-hour blood pressure monitoring results in a group of 206 patients (109 males) aged 6-20 years, mean age 14.62 ± 2.73 years referred to our cardiology and nephrology clinic as hypertension. Normal findings had 58 (28%), prehypertension was present in 89 (43%) and confirmed arterial hypertension (primary and secondary) in 59 (29%) of patients.

Table 1. Nocturnal dipping in children – distribution by gender, age and arterial blood pressure

<table>
<thead>
<tr>
<th>Number of children (N)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys, N (%)</td>
<td>109 (53)</td>
</tr>
<tr>
<td>Age (years) (SD)</td>
<td>14.62±2.73</td>
</tr>
<tr>
<td>Normotensive (&lt;90 C)(N,%)</td>
<td>58(28)</td>
</tr>
<tr>
<td>Prehypertensive (90-95 C)(N,%)</td>
<td>89(43)</td>
</tr>
<tr>
<td>Hypertensive (&gt;95 C)(N,%)</td>
<td>59(29)</td>
</tr>
<tr>
<td>Prehypertensive</td>
<td></td>
</tr>
<tr>
<td>Non-dippers (N,%)</td>
<td>53 (60)</td>
</tr>
<tr>
<td>Dippers (N, %)</td>
<td>36(40)</td>
</tr>
</tbody>
</table>
Results:

- In the group of prehypertensive patients 53 (60%) of them were non-dippers. Obesity played important role in prehypertensive blood pressure changes – among non-dipping patients almost one half were obese (47%), in comparison with dippers with the significantly lower prevalence of obesity (39%) (p< 0.01).
Table 2. Nocturnal dipping in normotensive and prehypertensive children

<table>
<thead>
<tr>
<th></th>
<th>Normotensive</th>
<th>Prehypertensive</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dipping, systole (%)</td>
<td>9,2±7,54</td>
<td>9,33±5,92</td>
<td>0,66</td>
</tr>
<tr>
<td>Dipping, diastole (%)</td>
<td>12,26±8,52</td>
<td>11,45±7,84</td>
<td>0,45</td>
</tr>
</tbody>
</table>

Table 3. Nocturnal dipping in obese patients

<table>
<thead>
<tr>
<th>Prehypertension</th>
<th>Obesity (BMI&gt;95C)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-dipper (N, %)</td>
<td>25 (47)</td>
<td></td>
</tr>
<tr>
<td>Dipper (N, %)</td>
<td>14(39)</td>
<td>P&lt;0,01</td>
</tr>
</tbody>
</table>

Conclusion: The absence of nocturnal drop in blood pressure is a common finding in prehypertensive patients and is significantly associated with the increased body mass index.
Non-invasive measurements of central blood pressure with arterial stiffness indicators as a new research tool for predicting cardiovascular risk in children with type 1 diabetes mellitus and obesity

Klaudyna Noiszewska, Mateusz Puchalski, Anna Skolimowska, Artur Bossowski

1. Students’ Scientific Association at the Department of Pediatrics, Endocrinology, and Diabetology with Cardiology Division, Medical University of Białystok, Poland
2. Department of Pediatrics, Endocrinology, and Diabetology with Cardiology Division, Medical University of Białystok

Introduction

- The main problem of modern diabetology is the prevention of late complications in the course of carbohydrate metabolism disorders. Both type 1 diabetes (DM1) and obesity (predominantly to DMO) due to metabolic disorders affect the cardiovascular system by increasing vascular stiffness. It is therefore necessary to find simple tools that allow rapid identification of vascular disorders.
- Blood pressure measurement is one of the simplest methods of patients’ cardiovascular assessment. However, non-invasive measurement of Central Blood Pressure (CBP), with augmentation and amplification indices, is accurately reflecting the condition of blood vessels and may be useful in monitoring of patients with diabetes. However, there are not enough studies in the pediatric population.

Materials and methods

- The study involved 100 children matched in terms of age, body weight, height and sex (average age 12 years). The control consisted of 35 healthy children (Girls: 21; Boys: 14). The study group included patients with short-term DM1<5 years (G: 9; B: 12) and long-term DM1>5 years (G: 12, B: 13) as well as patients with obesity (G: 6, B: 10) under the care of Department of Pediatrics, Endocrinology, and Diabetology in Białystok.
- Three consecutive measurements were made at 5 minute intervals using Centron Diagnostic non-invasive DCMBP system connected to the brachial cuff and computer. Peripheral and central systolic and diastolic pressure as well as stiffness indexes – AUG – augmentation index and AMP – amplification index were determined, mean values were calculated. Statistical analysis was performed using Statistica 7 (Student’s ‘t’ test).

Results

- Both in girls and boys with DM1 a clear trend was observed for unfavorable variability of vascular stiffness indexes (AUG/AMP) for Girls C: G DM1<5 years → 0,78/1,75, 0,62/1,64, 0,59/1,74; Boys C: B DM1<5 years → 0,58/1,78, 0,62/1,61, 0,59/1,75.) Without statistical reference relevance between groups.
- Patients with DM1 suffering > 5 years were characterized by a better AUG and AMP values than the DM1<5 group regardless of gender.
- Also regardless of gender, values of CBP did not show statistically significant differences.
- However, in obese girls and boys we observed statistically significantly higher values of CBP and PP (CBP:PP for Girls C: vs G: 99/28 vs 124/36, p<0,007; Boys C vs CB: 100/33 vs 114/36, p<0,004).
MEASUREMENT OF SYSTOLIC BLOOD PRESSURE AT HOME BY PARENTS USING HAND-HELD DOPPLER DEVICE AND ANEROID SPHYGMOMANOMETER: A SINGLE CENTRE EXPERIENCE

Joanna Newton1, Cheentan Singh1,2, Manish D Sinha1,3
1 Paediatric Nephrology, Evelina London Children’s Hospital, St Thomas NHS UK
2 Paediatrics, North Middlesex University Hospital, NHS, UK
3 Kings College London, St Thomas NHS UK

INTRODUCTION:
• There are limited data regarding the clinical use of home BP monitoring in infants, children and young people unable to tolerate 24-hour ambulatory BP monitoring (ABPM)(1,2).
• We taught parents to perform Doppler assisted systolic BP monitoring at home (HDBPM) using an aneroid sphygmomanometer.

METHODS:
• Retrospective review over 5-years of children referred to our tertiary hypertension service for whom parents performed HDBPM.
• During a planned hospital appointment, parents were taught to perform HDBPM. They performed monitoring over at least two weeks with three measurements in quick succession twice a day.

RESULTS:
• 116 children underwent HDBPM with median (IQR) age, 2.25 (0.83 – 4.9) years [Figure: 1].
• HDBPM was used as children were too young (n=80, 69%) or thought unlikely to tolerate ABPM (n=36, 31%) because of underlying learning difficulties, neurological disease or similar condition.
• Children had been referred to our service for confirming hypertension (52%, n=60) [Figure: 2] or for ongoing monitoring (48%, n=56) for those on anti-hypertensive therapy [Figure: 3].
• None of the children required admission to hospital for management of their hypertension.

CONCLUSION:
• In those unable to tolerate or too young to have 24-hour ABPM, we demonstrate Doppler device assisted BP measurement by parents is feasible.
• 90% of those referred with hypertension were identified to be normotensive following HDBPM and in a further 33% with confirmed hypertension, medication changes were made.
• We conclude that HDBPM is a clinically useful out-of-office BP measurement technique in this diverse and challenging group of children.

REFERENCES:
Key facts
1. Few areas outside a hospital environment measure children’s BP in the UK. Those that do, don’t follow the guidance of published standards.
2. Most common reasons for measurement errors include incorrect cuff size (normally too small) and the use of electronic automated monitors which often overestimate the BP in children and can cause distress/discomfort in children with very elevated BP.
3. We carried out a small pilot study of the internal/external referrals to the renal unity over a 6 month period.

Results
Almost 20% of referrals of babies and young children were not having their BP measured using the recommended standards by the British Hypertension Society, US National High Blood pressure Education Program or European Society of Hypertension.

Conclusion
Following the sharing of best practice the referral rate both internal and external referrals dropped significantly.
INTRODUCTION: PHEOCHROMOCYTOMAS (PCCS) ARE RARE NEOPLASMS THAT ORIGINATE IN THE ADRENAL MEDULLA. THEY ARE FORMED BY CHROMAFFIN CELLS THAT SYNTHESIZE AND RELEASE CATECHOLAMINES. PARAGANGLIOMAS (PGLS) MAY ARISE IN ANY ORGAN THAT CONTAINS PARAGANGLIONIC TISSUE. ITS DIAGNOSIS AND TREATMENT ARE WELL DEFINED IN ADULTS, BUT EXPERIENCE IN CHILDREN IS LIMITED.

OBJECTIVE: DESCRIBE AGE, PRESENTATION, COMPLEMENTARY TESTS, TREATMENT AND PROGNOSIS OF A SERIES OF CASES IN PEDIATRIC PATIENTS WITH PCC AND PGL DIAGNOSED IN THE JUAN P GARRAHAN PEDIATRIC HOSPITAL.


RESULTS: TWENTY MEDICAL HISTORIES WERE REVIEWED. WE FOUND 8 PATIENTS WITH PCC AND 12 WITH PGL. PRESENTATION AGE WAS 11.46 (7.09; 17.31), 14 MALES. ALL PATIENTS WITH PCC HAD SUSTAINED HYPERTENSION (HTN) FROM THE BEGINNING, BUT THIS SYMPTOM WAS ONLY PRESENT IN 41.7% (N = 5) OF THE PGLS. 75% (N = 6) OF CHILDREN WITH PCC, IN ADDITION TO HTN, PRESENTED WEIGHT LOSS, SWEATING AND EPISODIC PALPITATIONS. THE MOST FREQUENT REASON FOR CONSULTATION IN PGL, 58.3% (N = 7), WAS ABDOMINAL PAIN ASSOCIATED WITH NAUSEA AND VOMITING.

NO PATIENT WITH PCC PRESENTED MULTICENTRICITY, HOWEVER, 58.3% (N = 7) OF THE PGL WERE MULTICENTRIC WITH 4 DEATHS.

CONCLUSIONS: THE LOW PREVALENCE OF THESE TUMORS, MAKES THAT THE DELAY IN DIAGNOSIS CAN INTERFERE WITH HEALING, MAINLY IN PGL. THEY CAN BE DIAGNOSED IN FRONT OF THE REALIZATION OF IMAGES SUSPECTING RENAL CAUSE OF THEIR HTA. THE PCCS HAVE THE ADVANTAGE OF PRESENTING WITH MORE SUGGESTIVE SYMPTOMS AND EARLY DIAGNOSIS WITH THE INTRODUCTION OF AN ADEQUATE ANTIHYPERTENSIVE TREATMENT THAT ALLOWS YOU TO FACE NORMOTENSIVE SURGERY ENSURES HEALING, IF THE TUMOR RESECTION IS COMPLETE.
Analysis of a series of cases with Pheochromocytoma and Paraganglioma in pediatrics in a hospital in Argentina.

Deregibus María Inés¹; Pompozzi Luis¹; Sansó Gabriela²
¹Hospital de Pediatría SAMIC JP Garrahan. Buenos Aires, Argentina.
²Hospital de Niños Ricardo Gutiérrez. Buenos Aires, Argentina.

- 513 beds (137 PICU)
- 605000 visits/year
- 18 operating rooms
- 11000 surgeries per year
- 800 CV surgeries
- 900 neurosurgeries
- 140 transplants/year: bone marrow, liver, heart, kidney and lung
- Arterial Hypertension Service:
  - 301 visits/year
  - 105 patients/year
Analysis of a series of cases with Pheochromocytoma and Paraganglioma in pediatrics in a hospital in Argentina.
Deregibus María Inés1; Pompozzi Luis1; Sansó Gabriela2
1Hospital de Pediatría SAMIC JP Garrahan. Buenos Aires, Argentina.
2Hospital de Niños Ricardo Gutiérrez. Buenos Aires, Argentina.

## RESULTS I

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>PHEOCROMOCYTOMA (n=8)</th>
<th>PARAGANGLIOMA (n=12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Median (range)</td>
<td>11.72 (8.81;16.63)</td>
<td>11.05 (7.09;17.31)</td>
</tr>
<tr>
<td>Male Sex % (n)</td>
<td>75% (6)</td>
<td>66.7% (8)</td>
</tr>
<tr>
<td>Weight Median (range)</td>
<td>32 (20;45)</td>
<td>37.50 (23;75)</td>
</tr>
<tr>
<td>Size Median (range)</td>
<td>140.5 (120;160)</td>
<td>143 (122;180)</td>
</tr>
</tbody>
</table>

## RESULTS II

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>PHEOCROMOCYTOMA (n=8)</th>
<th>PARAGANGLIOMA (n=12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVM elevado* % (n)</td>
<td>62.5 (5)</td>
<td>57.1 (4)</td>
</tr>
<tr>
<td>Urinary Adrenalin High % (n)</td>
<td>71.4 (5)</td>
<td>62.5 (5)</td>
</tr>
<tr>
<td>Urinary Noradrenalin High % (n)</td>
<td>100 (7)</td>
<td>50 (4)</td>
</tr>
<tr>
<td>Pathologic Centellograma *** % (n)</td>
<td>62.5 (5)</td>
<td>62.5 (5)</td>
</tr>
<tr>
<td>Genetic Sindrome Associated****% (n)</td>
<td>71.4 (5): VHL (3) NF1 (3) SDHA (1)</td>
<td>50 (1): SDHB (1)</td>
</tr>
<tr>
<td>Multicentricity % (n)</td>
<td>0</td>
<td>58.3 (7)</td>
</tr>
</tbody>
</table>
Analysis of a series of cases with Pheochromocytoma and Paraganglioma in pediatrics in a hospital in Argentina.

Deregibus María Inés¹; Pompozzi Luis¹; Sansó Gabriela²
¹Hospital de Pediatría SAMIC JP Garrahan. Buenos Aires, Argentina.
²Hospital de Niños Ricardo Gutiérrez. Buenos Aires, Argentina.

RESULTS III

PHEOCHROMOCYTOMA

<table>
<thead>
<tr>
<th>Reason for consultation</th>
<th>Presentation symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impregnation</td>
<td>Nausea and...</td>
</tr>
<tr>
<td>HTN</td>
<td>Heart failure</td>
</tr>
</tbody>
</table>

HTA 100%

PARAGANGLIOMA

<table>
<thead>
<tr>
<th>Reason for consultation</th>
<th>Presentation symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submaxillary Tumor</td>
<td>Nausea and Vomiting</td>
</tr>
<tr>
<td>Dysphonia</td>
<td>Dysphagia</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>Heart failure</td>
</tr>
<tr>
<td>HTN</td>
<td>Respiratory Distress</td>
</tr>
<tr>
<td></td>
<td>Urinary infection to...</td>
</tr>
</tbody>
</table>

HTA 41.7%
RESULTS IV

Analysis of a series of cases with Pheochromocytoma and Paraganglioma in pediatrics in a hospital in Argentina. Deregibus María Inés1; Pompozi Luis1; Sansó Gabriela2
1Hospital de Pediatría SAMIC JP Garrahan. Buenos Aires, Argentina.
2Hospital de Niños Ricardo Gutiérrez. Buenos Aires, Argentina.

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>PHEOCHROMOCYTOMA (n=8)</th>
<th>PARAGANGLIOMA (n=12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP (1st consultation)</td>
<td>Median (range)</td>
<td>165 (145;210)</td>
</tr>
<tr>
<td>DBP (1st consultation)</td>
<td>Median (range)</td>
<td>110.5 (90;150)</td>
</tr>
</tbody>
</table>

Pheochromocytoma

Paraganglioma
Conclusions

The low prevalence of these tumors, makes that the delay in diagnosis can interfere with healing, mainly in PGL. They can be diagnosed in front of the realization of images suspecting renal cause of their HTA. The PCCs have the advantage of presenting with more suggestive symptoms and early diagnosis with the introduction of an adequate antihypertensive treatment that allows you to face normotensive surgery ensures healing, if the tumor resection is complete.
The Registry of primary hypertension in children and adolescents living in Slovakia

Šimurka Pavol¹, Baráková Anna², Regecová Valéria³

¹ Department of Pediatrics and Neonatology at University Hospital in Trenčín, Slovakia,
² National Health Information Centre, Bratislava Slovakia,
³ Centre of Experimental Medicine, Institute of Normal and Pathological Physiology, Slovak Academy of Sciences, Bratislava, Slovakia
The Registry of primary hypertension in children and adolescents was founded at the National Health Information Center in 2011 to get an overview of the situation in Slovakia and improve the treatment and prevention of hypertension (HT).

OBJECTIVE
- incidence of primary HT, respectively of high blood pressure (BP)
- prevalence of obesity
- percentage of non-dippers
- effectivity of the treatment
- comparison with the results of the previous pilot study in 2013

SUBJECTS

Patients of 45 Pediatric cardiologic clinics
**RESULTS**

**Prevalence of overweight and obesity by gender, pharmacotherapy and dipping**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age</td>
<td>15.6 y</td>
<td>14.6 y</td>
</tr>
</tbody>
</table>

*Increased BP is most commonly found after 15th y in boys or 14th y in girls.*

*Family history:* Hypertension - 61%, Obesity - 23.4%.

---

<table>
<thead>
<tr>
<th>BMI Category</th>
<th>OB</th>
<th>OB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boys</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>53%</td>
<td>33%</td>
</tr>
<tr>
<td>All</td>
<td>43%</td>
<td>38%</td>
</tr>
<tr>
<td>Slovak</td>
<td>6%</td>
<td>0</td>
</tr>
</tbody>
</table>

| **Girls**    |    |    |
| Dippers      | 36%| 44%|
| Non Dippers  | 49%| 33%|
| Therapeutic  | 48%| 35%|
| No           | 38%| 40%|

Prevalence of obesity (> 90% alimentary): 5 times higher than in general population
- More frequent in:
  - Girls (54%)
  - Treated pts (48%)
  - Non dippers (50%)
In boys prevalence of obesity remained the same, overweight increased by 3%.

In only ¼ girls was BMI normal, prevalence of obesity increased by 6%.

Weight category was changed in 22% of pts.

While 14% boys managed to lose weight, girls (13%) gained weight.
Effectivity of the therapy

Normal BP by control examinations in 17 y adolescents (n = 199)

In 51% boys BP and 29% girls BP was normalized without pharmacotherapy

Persisting pharmacotherapy

In 2/3 of adolescents pharmacotherapy must continue to maintain normal BP

Summary

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of new pts/1 year</td>
<td>263,3</td>
<td>169</td>
<td>↓ 36 %</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>***</td>
</tr>
<tr>
<td>Non dippers (%)</td>
<td>44,2</td>
<td>45,7</td>
<td>↑ 1,5 %</td>
</tr>
<tr>
<td>Pharmacotherapy (%)</td>
<td>64,1</td>
<td>60,1</td>
<td>↓ 4 %</td>
</tr>
<tr>
<td>Overweight including obesity (%)</td>
<td>61,1</td>
<td>63,7</td>
<td>↑ 2,6 %</td>
</tr>
</tbody>
</table>
Analysis points out (so far):

- The declining number on control and new-onset HT reports.
- Regardless of therapy non-dipping was detected in 45 % pts.
- High prevalence of obesity or overweight (64 %) with increasing trend in girls.

- From the drop in the number of reports in the „Registry“, it can not be clearly deduce that the incidence of hypertension in children and adolescents in Slovakia is really decreasing.
- We expect an improvement of data, as according to a new Decree of the Ministry of Health, the reports on hypertension will be obligatory.
- The results of the study suggest that effectiveness of prevention and treatment of primary hypertension has not yet reached a satisfactory level.

Supported by the Grants: VEGA No 2/0160/17, No 2/0190/17