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Blood pressure measurements in busy pediatric settings – The importance of proper arterial blood pressure measurements of obese children in every day office settings

Merenje arterijskog pritiska u pedijatrijskoj ambulanti – Značaj pravilnog merenja krvnog pritiska u gojazne dece u svakodnevnoj pedijatrijskoj praksi

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Summary

In the busy pediatric office setting it is of particular importance to accurately recognize obese children without hypertension and/or other metabolic disturbances, to avoid their unnecessary clinical evaluation and exposure to stress. The aim of this study was to compare the prevalence of arterial hypertension in obese children with or without standard preparation.

A total of 120 obese adolescents, 81 boys and 39 girls, mean age and 16.8 ± 1.2 years, who were recruited in the Primary Health Care Center at their regular check-up, were included in the study. In the first group a 60 obese adolescents blood pressure (BP) was measured immediately upon meeting "classic" way of BP measuring, while in the second group of 60 obese adolescents, BP was measured according to 4th NHBPEP recommendation.

We found a higher proportion of systolic hypertension in a those obese adolescents in whom the BP was measured without preparation compared to obese adolescents in whom BP was measured according to 4th NHBPEP measurement. The chi-square statistic was 4.3568. p =0.037.

In spite of the time shortage in everyday busy pediatric office setting, it would be prudent to set aside a more time for blood pressure measuring in obese children and spare them from further unnecessary exposure to stress.

Key words: arterijski pritisak, deca, ambuanta

Sažetak

U svakodnevnom radu pedijatra, od velikog je značaja prepoznati gojaznu decu bez hipertenzije i drugih pridruženih metaboličkih poremećaja kako bi se ista poštedela nepotrebnih dodatnih kliničkih ispitivanja.

Cilj studije je upoređivanje prevalence povišenih vrednosti krvnog pritiska u gojazne dece nakon merenja pritiska sa ili bez standardne pripreme.

Studijom je obuhvaćeno 120 gojazne dece, 81 dečak i 39 devojčica, prosečne starosti 16.8 ± 1.2 godina kojima je pritisak meren u sklopu rutinskog godišnjeg sistematskog pregleda.Sva deca su podeljenau dve grupe. Grupu od 60 gojazne dece gde je pritisak (TA) meren odmah po dolasku dece i drugu grupu od 60 gojazne dece gde je krvni pritisak meren po standardnim preporukama.

Deca kod kojih je TA meren odmah po dolasku u odnosu na grupu dece gde je TA meren po standardnim preporukama imaju statistički značajno veću prevancu hipertenzijechi- kvadrat = 4.3568. p =0.037.

Uprkos vremenskog ograničenja u trajanja pregleda u pedijatrijskoj ambulatni, veoma je značajno izmeriti pritisak gojaznoj decipo standardnim preporukama, a kako bi se ista poštedela nepotrebnih kliničkih ispitivanja u slučaju pogrešne dijagnoze.

Ključne reči: *blood pressure, children, outpatient settings*

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Introduction

Arterial hypertension is a well-defined cardiovascular risk factor especially in obese individuals, both children and adults (1,2)

Depending on the used protocols and methodology for measuring blood pressure (ambulatory blood pressure recording vs. standard sphygmomanometer) the prevalence of true hypertension in obese children and adolescents significantly varies (3,4,5)

Chiolero et al. found that the proportion of children with elevated BP based on one visit was five times higher than based on three measurements taken at few-week intervals (5).

The aim of this study was to compare the prevalence of systolic arterial hypertension in obese with or without standard preparation at first visit.

Material and Methods

Study design

We conducted a cross-sectional study of 120 obese children 81 boys and 39 girls, mean age 16.8 ± 1.2 years, to explore the prevalence of office hypertension. The children were selected from secondary schools in Nis, and were recruited in the Primary Health Care Center at their regular check-up,, from January 2018 to April 2019. The inclusion criteria were 1) BMI > 95 percentile 2) No history of acute disease 3) No history or regular use of antihypertensive medication. Obesity was defined as a BMI at or above the 95th percentile according to the reference values published by the Centers for Disease Control and Prevention. Body mass index (BMI) was calculated as weight (in kg) divided by height (in m) squared (7).

The study was approved by the Ethical Committee for Medical Research, (protocol number 01-9002-6). We obtained informed consent from the parents of children included in the study.

In all children BP was measured on right arm (to avoid possibility of coarctation of the aorta) with a standard sphygmomanometer of appropriately sized cuff, using a stethoscope placed over the brachial artery pulse, proximal and medial to the cubital fossa, and below the bottom edge of the cuff ; Hypertension was defined as systolic BP values greater than 95 percentiles.

It the first group of 60 consecutive adolescents, BP was measured immediately upon meeting while in the second group of 60 adolescents BP was measured according to 4th NHBPEP recommendation. This assumed that before the measurement the child had been sitting quietly for 5 minutes, and seated with his or her back supported with feet on the floor and right arm supported.

Statistical analysis

Data are presented as mean ± standard deviation. The assumption of normality was checked through Shapiro-Wilk test. We used two-sample t test for parametric continuous variables to compare examined parameters between groups.

A chi-square test was performed to test the null hypothesis of no association between a number (percentages) of hypertensives and normotensives in studied groups. The p-value < 0.01 was considered statistically significant. All statistical analyses were performed using SPSS version 20 (SPSS, Chicago, IL, USA).

Results

Characteristics

Of the initial sample of 124 adolescents, 3 were excluded because of common cold and one because of active smoking before the checkup. The study ultimately included 120 obese adolescents who fulfilled the inclusion criteria.
Most of the participants were boys (67.5%) with a mean age of 17,2 ± 0.9 years.

There was no statistically significant difference in age, sex and BMI between groups with and without systolic hypertension. However, we found significantly higher systolic blood pressure values in children with “classic” BP measuring compared to children in whom a BP was measured according to 4thNHBPEP criteria in both BP categories normotensives (109.4 ± 7 vs. 102.2 ± 12) and hypertensives (134.8 ± 11 vs 128.3 ± 9)

The prevalence of hypertension in a group with classic BP measurement was 26,6 %, while in a second group 11,6 % adolescents had hypertension. Detail characteristics of the participants according to the prevalence of systolic hypertension are presented in Table 1.

Table 1. The demographic and clinical data of obese adolescents

	Total (n=60) (100 %)	Mean BP in Normotensives (immediately upon meeting)	Mean BP in Hypertensives (immediately upon meeting)	Mean BP in Normotensives 4thNHBPEP criteria	Mean BP in Hypertensive 4thNHBPEP criteria	P - (normotensives vs. hypertensives)
Age (years) (mean±SD)	16.8 ± 1.2	111.2 ± 11.2	124.4 ± 12.9	108-3 ± 11.2	121.6 ± 11.1	P>0.5
BMI (kg/m2)	26.4 ± 2.8	25.8 ± 2.8	27.4 ± 2.8	24.5 ± 2.4	26.5 ± 2.2	P>0.5
TA	107.3 ± 13	109.4 ± 7	134.8 ± 11	102.2 ± 12	128.3 ± 9	P<0.5

Table 2. Association between a number of hypertensives and normotensives according to the type of blood pressure measurements.

	Total (n=60) (100 %)	Number of Normotensives (immediately upon meeting)	Number of Hypertensives (immediately upon meeting)	Number of Normotensives 4thNHBPEP criteria	Number of Hypertensives 4thNHBPEP criteria	P (normotensives vs. hypertensives)
Girls, n (%)	16.4 ± 1.4	13 (10.8%)	6 (5%)	17 (14.1%)	3	P<0.5
Boys, n (%)	17,2 ± 0.9	31(25.8%)	10 (8.3%)	36 (30%)	4 (3.3%)	p>0.5
Total (%)		44 (36.6%)	16 (13.3%)	53 (44.1%)	7 (5.8 %)	P<0.05

As of the prevalence of hypertension, we found a higher proportion of systolic HAT in a those obese adolescents having classic measurement compared to group those with 4th NHBPEP measurement, $\chi 2$ (1, N = 120) = 4.3568, p = 0.004. The chi-square statistic is 4.3568. p =0 .037. They had 2,3 times higher prevalence of high BP compared to those with BP NHBPEP measurement.

Discussion

The most important finding of our study is that the prevalence of systolic hypertension is significantly lower in those obese adolescents in whom BP was measured with appropriate preparation, according 4th NHBPEP recommendations compared to the prevalence of systolic hypertension in those obese adolescents in whom BP was measured in classic way, immediately upon meeting. Likewise, obese adolescent in whom BP was measured in line with 4th NHBPEP recommendations had lower systolic BP compared to values of BP in obese adolescents in whom BP was measured in "classic way".

The most studies assessing the prevalence of hypertension in pediatric populations imply the firm sticking to 4thNHBPEP recommendations which is a gold standard for measuring BP in children. However the BP measurements according to NHBPEP standards are time consuming and very hard to implement in everyday busy pediatric settings.

To our knowledge there are no studies examining the differences between different BP methodologies during singe check-up visits. Nevertheless, it is well known that BP values tend to get lower after every repeated measurement and are not ideal marker of BP status when performed only once and without preparation.

Chiolero at al. found that the proportion of obese children with elevated BP based on one visit was five times higher than based on three measurements taken at few-week intervals (5).

On the other hand, Aronovitch-Mazor et al. also reported greater prevalence of elevated BP at first measurement (44.1%) compared to BP measurement (33%) during second visit, a few days apart which is partly in accordance with our results on the arterial hypertension prevalence after repeated measurements during one visit(4.)

According to our results, we would like to stress the importance of proper BP measurement in everyday busy pediatric setting to eliminate incidentally elevated BP as well as unnecessary referral of children for subspecialty care.

In addition, many of obese children with elevated BP measurement could have white coat hypertension phenomenon which can be avoided in case of implementing current NHBPEP standards of BP measurements.

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