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Prevalence of arterial hypertension among Ukrainian students: the comparison of European and American guidelines

Częstość występowania nadciśnienia tętniczego wśród ukraińskich studentów: porównanie wytycznych europejskich i amerykańskich

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Abstract

Introduction: Arterial hypertension (HTN) among children is progressively increasing. These concerns have led to an update of the guidelines about childhood hypertension by the European Society of Hypertension (ESH) in 2016 and the American Academy of Pediatrics (AAP) in 2017, and their thresholds for HTN differ. The current research aims to compare the prevalence of hypertension in Ukrainian teenagers using 2 different guidelines and to check the impact of gender, age, and excess weight on hypertension.

Material and methods: The sample includes 540 Ukrainian students of 2 secondary urban schools, aged 10–17 years. Blood pressure and anthropometrical measurements were taken and compared with percentile tables.

Results: The prevalence of abnormal BP (11.3% and 15.2%) and HTN (1.9% and 4.1%) was determined with ESH and AAP guidelines, respectively, and they strongly depended on which definitions and criteria were used. Boys were much more predisposed to abnormal BP. Comparing both guidelines, there was no significant difference in HTN prevalence in children aged 10–12 years; nevertheless, AAP recognized HTN almost twice as often in teenagers aged ≥ 13 years. Excess body weight was identified in 17.2% of the school-age children, twice as frequently as in males.

Conclusions: The results have shown a higher prevalence of HTN in teenagers and children with excessive weight more significant in boys and between children with positive markers of abdominal obesity due to both guidelines, without a significant difference in prevalence after re-classification; however, AAP recommendations might be preferable.

Key words:
adolescents, excess weight, guidelines implementation, prevalence of hypertension.

Introduction

Paediatric hypertension (HTN) is now commonly observed as the main, potentially reversible cause of cardiovascular disease in many countries worldwide. The long-term health risks to children with hypertension may be substantial. Results of large epidemiological studies indicate that hypertension is increasing linearly with age from 7.5% among adults aged 18–39 years to 33.2% among those aged 40–59 years, and 63.1% among those aged 60 years and over [1]. According to a recently conducted systematic review and meta-analysis of published data about the global prevalence of HTN in children 6–19 years old, the pooled prevalence of prehypertension is 9.67% and 4.0% for hypertension [2]. Within the last 2 decades, primary HTN is becoming the dominant cause of HTN in children above 6 years of age, especially in adolescents, and is closely related to body composition and adiposity [3]. That is why the early recognition of HTN in childhood is crucial if there are to be early interventions that reduce cardiovascular morbidity and mortality later in life. These concerns have led to an update of the guidelines about childhood hypertension: the European Society of Hypertension (ESH) guidelines for the management of high blood pressure (BP) in children and adolescents (2016) [4] and the Clinical Practice Guideline for the screening and management of high BP in children and adolescents of the American Academy of Pediatrics (AAP) (2017) [5]. One of the main differences between them is the level of BP for the diagnosis of hypertension. The American guideline suggests a BP over 130/80 mmHg for 13 years and older children, while the European cut-off for the diagnosis of hypertension in children aged ≥ 16 years is 140/90 mmHg. Before 2017, both American and European guidelines used nomograms created in the same reference population, which included children of all weight classes. Given the close and well-known association between hypertension

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and excess weight in childhood, the AAP guidelines proposed new reference nomograms excluding subjects with overweight and obesity from the "historical" reference population [5]. Shortly after the publication of both guidelines these statements caused active discussion, their sensitiveness was tested and the percentage of re-classified children differed in some populations [6–8]. For example, higher mean population BP results in more reclassifications and vice versa. The published data on the prevalence of HTN in Ukrainian children are insufficient.

Therefore, the purpose of the current research is to compare the prevalence of hypertension in Ukrainian teenagers using 2 different guidelines: European guidelines (2016) and American guidelines (2017), and to check the impact of gender and obesity on hypertension.

Material and methods

This was a prospective cross-sectional study conducted in 2 public schools in the spring months during the pre-COVID-19 period. The total number of children, aged between 10 and 17 years, citizens of Ternopil, which is a regional centre in Western Ukraine at the time of the study, was 119,390. According to our calculation, 383 children are required for a 95 ±5% confidence level. Our sample size was 540 children, which was quite representative. The following subjects were eliminated from the study: those who (1) had an acute or chronic systemic disease, (2) were absent during the time of conduction of the study due to any reason, or (3) were unwilling to participate in the research. Blood pressure was measured 3 times in one visit on both arms using an oscillometric BP monitor Omron M2 (HEM-7121-E) and confirmed by auscultatory measurements on 3 single occasions and interpreted using percentile tables according to height, age, and sex. Each participant's BP was categorized twice: once as defined in the AAP (in the right arm and assessed by taking the average of the last 2 measurements) and once as defined in the ESH (in the arm with the higher value and assessing the average of the last 2 measurements). According to both guidelines' percentile tables, a BP value below the 90th percentile by age, sex, and height is considered normal BP. Hypertension is defined as a systolic and/or diastolic BP at or above 95th percentile for individuals <13 years of age by AAP guidelines and for <16 years of age by ESH guidelines. Either elevated BP (by AAP) or high-normal BP (by ESH) is a value from ≥ 90th percentile to < 95th percentile. Anthropometric measurements were obtained by trained staff members using a wall-mounted stadiometer and a digital personal scale OMRON HN-289, using standard methods. To assess the physical development of each child, values of body weight, height, and body mass index (BMI) were assessed using AnthroPlus software [9]. Weight status was defined by WHO percentile tables according to BMI: underweight (< 5th percentile), normal weight (5–85th percentile), overweight (> 85th percentile), and obese (≥ 97th percentile). Waist circumference (WC) was measured at the midpoint between the last rib and the top of the iliac crest and evaluated by percentile charts for European-American children [10]. Hip circumference (HC) was measured at the maximum protuberance of the buttocks in a standing position. The waist-to-hip ratio (WHR) and waist-to-height ratio (WHtR) as a screening tool for abdominal obesity in children were calculated. Although international recommendations have not yet been developed, cohort studies demonstrate such limits of abdominal obesity in adolescents: WHtR > 0.5 regardless of gender in the 6-18 age group and WHR > 0.9 in boys/> 0.85 in girls [10–14]. The regional reference data are available for adolescents in some countries but are lacking for Ukrainian adolescents.

The study was conducted in accordance with the 1975 Declaration of Helsinki, revised in 1983, and approved by the Local Ethics Committees for scientific research on humans (minute of meeting 14 from 17th of October, 2018). All subjects were informed about the study, and oral consent was obtained from the parents or tutors of all participants.

Data are expressed as number and percentage or as mean ± standard deviation (SD) for normally distributed variables and median and interquartile range for skewed variables. Comparisons between independent categories were performed using the 2-sample t-test for normally distributed variables or the Mann-Whitney U test for skewed variables. A significance level of 5% and a confidence interval (CI) of 95% were considered for the analysis. Chi-square (χ^2) test was used to compare proportions. A p-value < 0.05 was considered statistically significant. The statistical analysis was performed using IBM SPSS Statistics, version 20.0.

Results

The average age of subjects was 13.83 ±0.08 years. Among them, 277 were boys (51.3%). Most children in the sample were above 13 years of age (70.4%) with normal weight (74.4%). The comparison of nutritional status between the sex groups showed statistical significance in height, weight, BMI-SDS, WC, WHtR, and WHR (Table I). It was determined that the WHtR and WHR were considerably lower in girls. Mean WC in boys was higher than in girls. We observed a higher proportion of girls with a deficit or normal weight and a 2-fold higher proportion of boys with overweight and 3-fold more obese boys. In total, 66 children (12.2%) in the sample were classified as overweight and 24 students (4.4%) were obese.

Our results confirmed a higher sensitivity of thresholds by AAP guidelines in comparison to ESH in the total sample of children during the first visit (Table II), but there was no significant difference in the prevalence of either abnormal BP (Table III) or HTN due to reclassification after 3 visits (Table IV). A statistically significant difference was found for abnormal BP and HTN in children aged 13–17 years and in children with normal weight.

Our study did not find a statistical difference in the prevalence of HTN in overweight or obese children due to reclassification.

It should be noted that we did not reveal the mean differences between systolic and diastolic BP in schoolchildren calculated by the methodology of both guidelines (always on the right arm by AAP and on the arm with higher value by ESH). Furthermore, there was no statistical difference in diastolic BP

Table I. Anthropometric data of the study sample

Variables	Girls	Boys	*p*	Total
Subjects, *n* (%)	263 (48.7)	277 (51.3)	–	540 (100)
Age, years	13.88 ±0.12	13.78 ±0.11	> 0.05	13.83 ±0.12
Height, cm	158 ±0.10	164 ±0.10	< 0.001*	161 ±0.10
Weight, kg	48.70 ±0.67	53.47 ±0.81	< 0.001*	51.14 ±0.54
BMI, kg/m^2	19.1 (17.1, 20.9)	19.7 (17.7, 21.4)	> 0.05	19.1 (17.4, 21.1)
BMI, SDS	–0.17 (–0.87, 0.54)	–0.01 (–0.63, 0.88)	0.004*	–0.08 (–0.76, 0.67)
WC	64 (60, 69)	68 (74, 83)	< 0.001*	66 (62, 71.5)
HC	88 (82, 94)	88 (82, 93)	> 0.05	88.0 (82, 93)
WHtR	0.40 (0.38, 0.43)	0.42 (0.39, 0.44)	< 0.001*	0.41 (0.39, 0.44)
WHR	0.74 (0.71, 0.78)	0.79 (0.76, 0.82)	< 0.001*	0.77 (0.73, 0.8)
Underweight, *n* (%)	25 (9.5)	20 (7.2)	> 0.05	45 (8.3)
Normal weight, *n* (%)	210 (79.8)	195 (70.4)	0.011*	405 (75.0)
Overweight, *n* (%)	22 (8.4)	44 (15.9)	0.008*	66 (12.2)
Obese, *n* (%)	6 (2.3)	18 (6.5)	0.017*	24 (4.4)

BMI – body mass index, HC – hip circumference; WC – waist circumference, WHR – waist-to-hip ratio; WHtR – waist-to-height ratio

Table II. Sample characteristics of children with abnormal blood pressures (BP ≥ 90th percentile) on the first visit

Variables	Total *n* (%)	According to ESH guideline *n* (%)	According to AAP guideline *n* (%)	χ^2 test *p*-value
	540 (100)	127 (23.5)	179 (33.1)	< 0.001*
Sex				
Male	277 (51.3)	76 (27.4)	103 (37.1)	0.014*
Female	264 (48.7)	52 (19.7)	76 (42.5)	0.015*
Age (category)				
10–12 years	160 (29.6)	18 (11.3)	29 (18.1)	0.082
13–17 years	380 (70.4)	110 (28.9)	150 (39.5)	0.002*
Weight status				
Underweight	45 (8.3)	6 (13.3)	7 (15.6)	0.764
Normal weight	405 (75.0)	82 (20.2)	125 (30.7)	0.001*
Overweight	66 (12.2)	27 (40.9)	34 (51.5)	0.222
Obese	24 (4.5)	12 (50.0)	13 (54.2)	0.773

Table III. Sample characteristics of children with abnormal blood pressures (BP ≥ 90th percentile) after 3 visits

Variables	Total *n* (%)	According to ESH guideline *n* (%)	According to AAP guideline *n* (%)	χ^2 test *p*-value
	540 (100)	61 (11.3)	82 (15.2)	0.059
Sex				
Male	277 (51.3)	47 (17.0)	61 (22.0)	0.133
Female	264 (48.7)	14 (5.3)	21 (7.5)	0.221
Age (category)				
10–12 years	160 (29.6)	10 (0.25)	10 (6.25)	1.0
13–17 years	380 (70.4)	51 (13.4)	72 (18.9)	0.039*
Weight status				
Underweight	45 (8.3)	1 (2.2)	2 (4.4)	0.557
Normal weight	405 (75.0)	27 (6.7)	44 (10.9)	0.035*
Overweight	66 (12.2)	19 (28.8)	26 (39.4)	0.199
Obese	24 (4.5)	10 (41.7)	12 (50.0)	0.562

Table IV. Sample characteristics of children with hypertension (BP ≥ 95th percentile) after 3 visits

Variables	Total *n* (%)	According to ESH guideline *n* (%)	According to AAP guideline *n* (%)	χ^2 test *p*-value
	540 (100)	10 (1.9)	22 (4.1)	0.052
Sex				
Male	277 (51.3)	9 (3.2)	18 (6.5)	0.076
Female	264 (48.7)	1 (0.4)	4 (1.5)	0.178
Age (category)				
10–12 years	160 (29.6)	3 (1.9)	4 (2.5)	0.702
13–17 years	380 (70.4)	7 (1.8)	18 (4.7)	0.025*
Weight status				
Underweight	45 (8.3)	0	0	
Normal weight	405 (75.0)	1 (0.2)	7 (1.7)	0.033*
Overweight	66 (12.2)	6 (8.7)	10 (14.5)	0.286
Obese	24 (4.5)	3 (12.5)	5 (20.8)	0.439

in the 2 sex groups, but we identified a higher mean systolic BP in boys by ESH thresholds (Table V). Our study identified the statistical difference in the prevalence of normal BP after reclassification in boys. Abnormal BP was confirmed in 17.0% of boys and only in 5.3% of girls by ESH thresholds ($p < 0.001$), and by AAP thresholds in 22.0% and 7.5%, respectively ($p < 0.001$). HTN was detected in 3.2% in males and only 0.4% in females by the ESH guideline ($p = 0.013$) and 6.5% and 1.5% according to the AAP guideline, respectively ($p = 0.003$) (Table V). Accordingly, by both guidelines we recognized that boys in our population are much more predisposed to abnormal BP and HTN.

At the same time, there was no significant difference in abnormal BP and HTN due to reclassification by different thresholds in both sex groups in our study (Table V). The HTN was registered much more often between children with normal weight or underweight, without abdominal obesity (WC < 90 perc, WHtR < 0.5, WHR < 0.9 in boys and < 0.85 in girls) but not in children with excess weight or with positive markers of abdominal obesity in particular by both guidelines (Table VI).

Using AAP thresholds for HTN identification is more sensitive in children; however, our study did not realize sex preference for children with obesity in particular (Table VII).

Discussion

In the study, by using both ESH and AAP guidelines, we have detected the prevalence of abnormal BP (11.3% and 15.2%) and hypertension (1.9% and 4.1%) in Ukrainian children aged 10–17 years. The prevalence of high BP varies widely across worldwide studies (range 0.6–25.1%) performed at different times, in different manners, age groups, and populations of children and adolescents. For instance, the prevalence of prehypertension and hypertension in Lithuanian adolescents aged 12–15 years is 12.8% and 22.2%, respectively [15], in 9–13-year-old Greek schoolchildren it is 14.2% and 23%, respectively [16], in Portuguese children and adolescents aged 4 to 18 years it is 21.6% and 12.8%, respectively [17] and in 10–18-year-old Polish schoolchildren it is 6.6% and 8.9%, respectively [18], while in the US paediatric population HTN has been estimated to affect from 0.1% to 0.3% of children aged 3–17 years [19] and 0.19 to 0.38 per 1000 children in Taiwan [20].

The higher prevalence of HTN in children according to AAP criteria is predictable due to the methodological differences of both guidelines. However, numerous studies have found that HTN in children is closely associated with the occurrence and cardiovascular outcomes in adulthood [7, 8, 21]. And one of the crucial aims of preventive paediatrics is to detect children with higher cardiovascular risk at an early stage. Therefore, it is useful to realize whether or not applying the AAP thresholds helps identify children and adolescents at higher cardiovascular risk, and do the age, sex, and body composition matter?

It was confirmed that a rapid increase in the prevalence of HTN observed during puberty together with growth spurt is seen mainly in boys and is related to the physiological increase of systolic BP seen especially in boys [3]. However, that depends on the stage of pubertal development, which is usually incomplete at 13 years of age but is generally achieved at up to 16–18 years. Our study identified no statistically significant difference in the prevalence rates after re-classification in children 10–12 years old, but twice as often HTN by AAP after 13 years old teenagers.

This study reports that by both guidelines 17.0% and 22.0% of boys and 5.3% and 7.5% of girls have abnormal BP, and the prevalence of HTN is 0.4% and 1.5% among girls and 3.2% and 6.5% of boys in Ukraine. We confirmed that boys are generally 3 times more predisposed to abnormal BP, which is close to the results of other studies [15, 18, 20]. Sebekova *et al*., based on survey data from 2543 Slovak students of secondary schools aged from 16 to 23 years, showed that 15% of males and 4% of females presented high normal BP whilst 9% and 1%, respectively, had hypertension [22]. However, a meta-analysis of global trends recognized no statistically significant difference in prevalence rates between sexes [2].

According to the large amount of published data, HTN is 3-5 times more common in obese children than in their healthy-weight age-mates. The relation between BMI and BP in childhood and adolescence was recently analysed in a large study consisting of 7 cross-sectional surveys conducted in China, Korea, Poland, the USA, India, Iran, and Tunisia [23]. It was observed that the relationship between BMI and elevated BP had its beginnings in the 25th BMI percentile. These relationships are especially important because, in the last few decades, the prevalence of overweight and obesity among children and adolescents has increased worldwide. Global analyses of BMI in children aged over 5 years and adolescents from 1975 to 2016 have concluded that the rise in excess weight in children and adolescents has plateaued in high-income countries but continues in low-income and middle-income countries [24].

Excess body weight in our study was identified in 16.6% (12.2% overweight and 4.4% obese) of the school-age children, twice as frequently in males. Similar proportions were reported in different regions of Ukraine [25] and other European countries [19, 26, 29]. A cross-sectional study of 13,739 children aged 6.0–18.9 years in Western Ukraine identified the combined prevalence of obesity and overweight among 17.6% of children aged 6–18 years old, based on WHO growth standards [27]. A meta-analysis of 58 papers from Turkey showed an escalation of obesity prevalence among children and adolescents through 1990-2015 from 0.6% to 7.3%. The prevalence of obesity increased in both sex groups. However, boys were more likely to be obese than girls [28]. In comparison with Slovenia, over the last 3 decades among 7–18 -year-old children overweight increased from 11.8 to 18.9% among boys and from 11.4 to 17% in girls, while obesity rose from 1.9 to 5.9% in boys and 1.7 to 4.7% in girls [29]. While in countries neighbouring Ukraine, the prevalence of overweight and obesity was 26.4% in boys and 20% in girls in Hungary [30], and in Poland, the prevalence of overweight and obesity in 6–19-year-old children and adolescents was 18.7% in boys and 14.3% in girls [18].

Children with excessive weight had abnormal BP and HTN significantly more often than proportional ones [3, 5, 6, 22, 23, 30], but we did not identify statistically better sensitivity of AAP criteria by reclassification, which may be due to an insufficient

Table V. Sex differences of BP level assessment by European and American guidelines

	Girls $n = 264$		p-value 2/3	Boys $n = 277$		p-value 5/6	p-value 2/5	p-value 3/6
	ESH	AAP		ESH	AAP			
1	2	3	4	5	6	7	8	9
Systolic BP, mmHg	110.35 ±0.78	110.31 ±0.77	$t = 0.04$ $p = 0.970$	113.54 ±0.91	112.27 ±0.89	$t = 1.0$ $p = 0.319$	$t = 2.66$ $p = 0.008$*	$t = 1.67$ $p = 0.096$
Diastolic BP, mmHg	68.49 ±0.65	68.41 ±0.64	$t = 0.09$ $p = 0.930$	69.85 ±1.31	68.21 ±0.63	$t = 1.13$ $p = 0.259$	$t = 0.31$ $p = 0.755$	$t = 0.22$ $p = 0.824$
Normal BP, n (%)	249 (94.7)	239 (90.5)	$\chi^2 = 2{,}705$ $p = 0.100$ OR = 1.736 95% CI: 0.894–3.374	221 (79.8)	198 (71.5)	$\chi^2 = 5{,}181$ $p = 0.023$* OR = 1,575 95% CI: 1,063–2,331	$\chi^2 = 25.046$ $p < 0.001$* OR = 0,238 95% CI: 0,131–0,432	$\chi^2 = 31.591$ $p < 0.001$* OR = 3.814 CI 95% 2.342-6.211
Abnormal BP, n (%)	14 (5.3)	21 (7.5)	$\chi^2 = 1{,}499$ $p = 0.221$ OR = 0.648 95% CI: 0.322–1.304	47 (17.0)	61 (22.0)	$\chi^2 = 2{,}254$ $p = 0{,}133$ OR = 0.724 95% CI: 0.474–1.105	$\chi^2 = 18{,}384$ $p < 0.001$* OR = 3,649 95% CI: 1,957–6,804	$\chi^2 = 20{,}800$ $p < 0.001$* OR = 3,268 CI 95% 1,926-5,554
Hypertension, n (%)	1 (0.4)	4 (1.5)	$\chi^2 = 1.817$ $p = 0.178$ OR = 0.247 95% CI: 0.027–2.226	9 (3.2)	18 (6.5)	$\chi^2 = 3.154$ $p = 0.076$ OR = 2.069 95% CI: 0.913–4.690	$\chi^2 = 6.138$ $p = 0.013$* OR = 0.113 95% CI: 0.014–0.900	$\chi^2 = 8.604$ $p = 0.003$* OR = 4.517 CI 95% 1.508-13.530

AAP – American Academy of Pediatrics guidelines; BP – blood pressure; CI – confidence interval; ESH – European Society of Hypertension guidelines; OR – odd ratio

Table VI. Dependency between frequency of HTN and anthropometric indexes in the sample

Parameters	Arterial hypertension, *n* (%)		OR	95%CI	χ^2 test	*p*-value
	ESH	AAP				
Normal weight or underweight children (*n* = 450)	1 (0.2)	7 (1.6)	0.141	0.017–1.150	4.540	0.033*
Overweight or obese children (*n* = 90)	9 (10.0)	15 (16.7)	0.556	0.230–1.345	1.731	0.188
WC < 90 perc. (*n* = 523)	6 (1.15)	18 (3.44)	0.326	0.128–0.827	6.141	0.013*
WC > 90 perc. (*n* = 17)	4 (23.5)	4 (23.5)	1.000	0.205–4.879	0.000	1.000
WHtR ≤ 0.5 (*n* = 510)	6 (1.18)	16 (3.14)	0.368	0.143–0.947	4.646	0.031*
WHtR > 0.5 (*n* = 30)	4 (13.3)	6 (20.0)	0.615	0.155–2.450	0.480	0.488
WHR ≤ 0.9 in boys/≤ 0.85 in girls (*n* = 531)	9 (1.70)	21 (3.95)	0.419	0.190–0.923	4.940	0.026*
WHR > 0.9 in boys/> 0.85 in girls (*n* = 9)	1 (11.1)	1 (11.1)	1.000	0.053–18.915	0.000	1.000

AAP – American Academy of Pediatrics guidelines; CI – confidence interval; ESH – European Society of Hypertension guidelines; OR – odd ratio; WC – waist circumference, WHtR – waist-to-height ratio; WHR – waist-to-hip ratio

Table VII. Sex difference of abnormal BP and body composition in sample

Abnormal BP, *n* (%)	Girls		*p*-value 2/3	Boys		*p*-value 5/6
	ESH	AAP		ESH	AAP	
	2	3	4	2	3	7
Underweight or normal weight	8 (3.4)	15 (6.3)	χ^2 = 2.239 *p* = 0.199 OR = 0.517 95% CI: 0.215–1.244	20 (9.2)	33 (15.2)	χ^2 = 3.632 *p* = 0.057 OR = 0.566 95% CI: 0.314–1.022
Overweight or obese	6 (24.0)	7 (28.0)	χ^2 = 0.104 *p* = 0.747 OR = 0.812 95% CI: 0.229–2.882	23 (38.3)	29 (48.3)	χ^2 =1.222 *p* = 0.269 OR = 0.664 95% CI: 0.321–1.374

AAP – American Academy of Pediatrics guidelines; CI – confidence interval; ESH – European Society of Hypertension guidelines; OR – odd ratio

number of identified patients. However, an Italian study with analysed a sample 2929 overweight/obese young people (6–16 years old) identified that children considered non-hypertensive by ESH 327 (11%) were reclassified using the lower cut-off point suggested by the AAP [7]. The authors studied cardio-metabolic risk factors in the reclassified subset and demonstrated that these children had an adverse risk factor profile compared with subjects not diagnosed with hypertension by the ESH.

The current study has several limitations. In our research, pubertal status, biochemical parameters, and target organ damage detection of the subjects were not evaluated. Also, the number of subjects with anthropometric markers of abdominal obesity was insufficient to make a clearer decision. Nevertheless, the strength of our research is that it is the first prospective cross-sectional study of healthy school-children in Ukraine with BP classified by the latest European and American guidelines, taking into account the sex and presence of excessive weight.

Conclusions

The prevalence of abnormal BP and HTN was identified as 11.3–15.2% and 1.9–4.1% in Ukrainian children aged 10–17 years, respectively, and is highly dependent on the definitions and criteria used.

We recognized that boys in our population are much more predisposed to abnormal BP by both guidelines.

The results have shown a higher prevalence of HTN in teenagers and children with excessive weight, which is more significant in boys and between children with positive markers of abdominal obesity due to both guidelines, without a significant difference in prevalence after reclassification; however, the AAP recommendations might be preferable.

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