

# 山东省 7~17 岁正常体重中小學生腹型肥胖流行现状及血压特征分析

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**【摘要】** 目的 了解正常体重儿童少年腹型肥胖的检出率及血压特征,为控制青少年肥胖和高血压提供参考。方法 以 2010 年山东省学生体质健康调查研究中 38 816 名 7~17 岁中小學生为研究对象,测量身高、体重、腰围和血压,依据 BMI 和腰围指标判定体重状况和腹型肥胖。结果 7~17 岁中小學生消瘦、正常、超重和肥胖的比例分别为 5.37%、72.47%、12.92% 和 9.24%。在正常体重的学生中,腹型肥胖检出率为 5.86% (女生 7.19%,男生 4.33%),女生高于男生 ( $P<0.01$ )。正常体重腹型肥胖组的收缩压和舒张压水平 ( $Z$  值) 高于正常腰围组 ( $P<0.01$ )。结论 正常体重腹型肥胖儿童少年的血压水平较高,应列为高风险人群并实施相应的干预措施。

**【关键词】** 腹型肥胖; 正常体重; 血压; 儿童

**Status quo and characteristics of blood pressure among children and adolescents aged 7-17 years at normal weight but with abdominal obesity, in Shandong province** ZHANG Ying-xiu, ZHOU Jing-yang, ZHAO Jin-shan, CHU Zun-hua, WU Guang-jian, WANG Ke-bo, XIAO Pei-rui. Shandong Provincial Center for Disease Control and Prevention, Jinan 250014, China

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**【Abstract】 Objective** To study the prevalence and characteristics of blood pressure (BP) among children and adolescents at normal weight but with abdominal obesity. **Methods** Using data from the 'Student physical fitness and health surveillance 2010 project' in Shandong province, a total of 38 816 students aged 7-17 years were selected to participate in this study. Stature, body weight, waist circumference (WC), systolic blood pressure (SBP) and diastolic blood pressure (DBP) of these subjects were measured. Body weight status and abdominal obesity were defined by body mass index (BMI) and WC, respectively. **Results** In total, the proportions of thinness, normal weight, overweight and obesity defined by BMI were 5.37%, 72.47%, 12.92% and 9.24% respectively. 5.86% of the children and adolescents with normal weight had abdominal obesity, with normal weighted girls (7.19%) having higher prevalence of abdominal obesity than boys (4.33%) ( $P<0.01$ ). The  $Z$ -scores of SBP and DBP for both boys and girls were all significantly higher in the normal weight but with abdominal obesity groups than in both normal weight and WC groups ( $P<0.01$ ). **Conclusion** Children and adolescents under normal weight but with abdominal obesity had higher BP level need to be identified and considered as high-risk individuals. Related intervention programs should also be targeted to this population.

**【Key words】** Abdominal obesity; Normal weight; Blood pressure; Children

BMI 判定青少年超重、肥胖在国内外已得到广泛应用<sup>[1-3]</sup>,且大量研究证实青少年超重、肥胖是高血压的重要危险因素<sup>[4-7]</sup>。近年来,采用腰围指标评价腹型肥胖的作用日益受到关注,并对向心性体脂积聚以及高血压、冠心病估测的准确率高于 BMI<sup>[8-12]</sup>。事实上,青少年群体中存在着部分体重正常(基于

BMI 指标)但腰围偏高(腹型肥胖)的个体<sup>[13]</sup>,与正常腰围的青少年相比,其血压水平如何则少有报道。为此本研究报告山东省正常体重儿童少年腹型肥胖的流行现状及血压特征。

## 对象与方法

1. 调查对象:来自 2010 年山东省学生体质健康调查资料。按照整群随机抽样的原则,在省内 16 个市抽取 7~17 岁汉族中小學生,每市随机抽取城乡小学、初中、高中各 1 所(共 6 所),每所学校各年级随

机抽取 2 个班(1 岁为一个年龄组,每市城乡男女生各年龄组约 50 人)。经内外科健康筛查,排除重要脏器疾患和发育异常、畸形的学生,最终入组 38 816 (男生 19 461,女生 19 355)名健康中小學生。样本具有较好的代表性。

2. 调查方法:按照全国学生体质健康调研测试细则要求,由经过培训的专业人员进行体格测量。使用身高计和杠杆秤测量受试者赤足身高(精确至 0.1 cm)和体重(受试者穿短衣裤,赤足;精确至 0.1 kg);使用尼龙带尺测量腰围(受试者露出腹部皮肤,平缓呼吸,将带尺下缘脐上 1 cm 处,水平绕一周,测量精确至 0.1 cm);使用汞柱血压计测量右侧肱动脉血压,根据不同年龄学生的上臂长度选择合适的袖带。以 Korotkoff 第 I 音为 SBP,第 V 音为 DBP。学生静坐 20 min 后连测 2 次,记录其均值。

3. 标准及定义:计算 BMI,依据中国儿童少年 BMI 超重肥胖筛查标准<sup>[2]</sup>和营养不良筛查标准<sup>[14]</sup>判定超重、肥胖和消瘦。BMI 高于性别年龄别营养不良界值点,低于超重界值点为正常体重。依据中国儿童少年腰围百分位数参考值判定腹型肥胖(腰围  $\geq 90$  th)<sup>[15]</sup>。将个体儿童的 SBP 和 DBP 对照 2005 年中国学生体质健康调查报告的中国汉族学生 SBP 和 DBP 的均值和标准差,转化为无单位、不受年龄影响的标化计量值 Z(Z score)。将正常体重儿童分为两组(正常体重正常腰围和正常体重腹型肥胖),比较两组儿童的血压水平(Z score)。

4. 统计学分析:数据采用 SPSS 11.5 软件统计处理。均值的比较采用 t 检验,率(构成比)的比较采用  $\chi^2$  检验。差异有统计学意义定为  $P < 0.05$ (双侧检验)。

## 结 果

1. 体重状况分布:38 816 名 7~17 岁中小學生消瘦、正常、超重和肥胖的比例分别占 5.37%、72.47%、12.92% 和 9.24%,男女生体重状况分布的差异有统计学意义( $\chi^2 = 735.46, P = 0.000$ ),见表 1。

2. 正常体重腹型肥胖检出率:28 129 名 7~17 岁正常体重中小學生共检出腹型肥胖 1647 人,检出率为 5.86%,女生检出率(7.19%)高于男生(4.33%),差异有统计学意义( $\chi^2 = 103.92, P = 0.000$ )。女生各年龄组检出率(5.32%~9.67%)高于

表 1 山东省 38 816 名 7~17 岁中小學生体重状况分布

性别	消瘦	正常	超重	肥胖
男	897(4.61)	13 173(67.69)	3020(15.52)	2371(12.18)
女	1189(6.14)	14 956(77.27)	1994(10.30)	1216(6.28)
合计	2086(5.37)	28 129(72.47)	5014(12.92)	3587(9.24)

注:括号外数据为人数,括号内数据为构成比(%)

男生(2.48%~6.78%),除 7~岁和 15~岁组外,差异均有统计学意义( $P < 0.05$ )。见表 2。

3. 血压水平比较:正常体重腹型肥胖组男女生 SBP 和 DBP 水平(Z score)均高于正常腰围组,差异有统计学意义( $P < 0.001$ ),见表 3。正常体重腹型肥胖男生 SBP、DBP 均值比正常腰围男生分别高 2.72~3.92 mm Hg、2.56~4.39 mm Hg,女生分别高 2.43~4.73 mm Hg、3.02~4.38 mm Hg(图 1)。

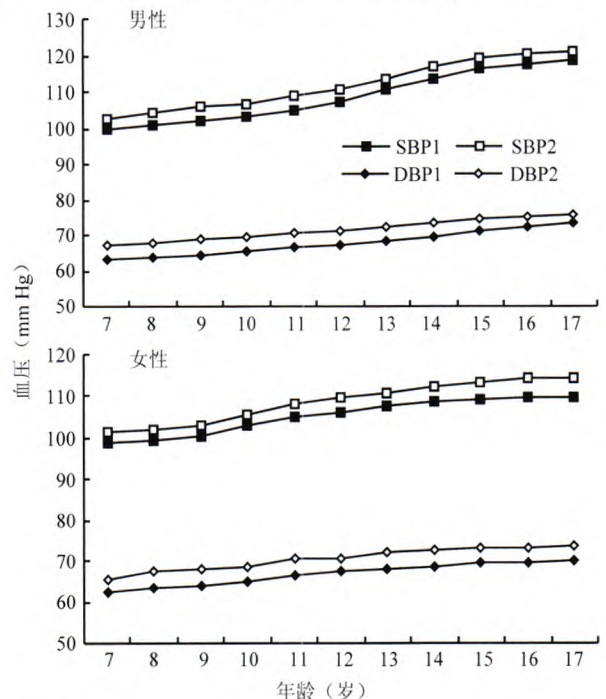


图 1 两组(1:正常体重和腰围;2:正常体重腹型肥胖)男女生 SBP 和 DBP 比较

表 2 山东省 7~17 岁正常体重中小學生腹型肥胖检出率的性别、年龄分布

年龄(岁)	男性		女性		$\chi^2$ 值	P 值		
	人数	正常腰围 <sup>a</sup>	腹型肥胖 <sup>b</sup>	人数			正常腰围 <sup>a</sup>	腹型肥胖 <sup>b</sup>
7~	1 121	1 075(95.90)	46(4.10)	1 241	1 175(94.68)	66(5.32)	1.92	0.165
8~	1 259	1 209(96.03)	50(3.97)	1 327	1 250(94.20)	77(5.80)	4.64	0.031
9~	1 090	1 063(97.52)	27(2.48)	1 355	1 268(93.58)	87(6.42)	21.13	0.000
10~	1 125	1 083(96.27)	42(3.73)	1 384	1 263(91.26)	121(8.74)	25.64	0.000
11~	1 142	1 111(97.29)	31(2.71)	1 386	1 308(94.37)	78(5.63)	12.88	0.000
12~	1 177	1 140(96.86)	37(3.14)	1 382	1 281(92.69)	101(7.31)	21.61	0.000
13~	1 231	1 155(93.83)	76(6.17)	1 413	1 286(91.01)	127(8.99)	7.35	0.007
14~	1 216	1 159(95.31)	57(4.69)	1 320	1 230(93.18)	90(6.82)	5.26	0.022
15~	1 301	1 237(95.08)	64(4.92)	1 410	1 318(93.48)	92(6.52)	3.22	0.073
16~	1 242	1 187(95.57)	55(4.43)	1 363	1 259(92.37)	104(7.63)	11.62	0.001
17	1 269	1 183(93.22)	86(6.78)	1 375	1 242(90.33)	133(9.67)	7.28	0.007
合计	13 173	12 602(95.67)	571(4.33)	14 956	13 880(92.81)	1076(7.19)	103.92	0.000

注:括号外数据为人数,括号内数据<sup>a</sup>构成比(%),<sup>b</sup>检出率(%)

表3 不同腰围状况的正常体重中小学生血压(SBP、DBP) Z分比较( $\bar{x} \pm s$ )

性别	正常腰围			腹型肥胖		
	人数	Z <sub>SBP</sub>	Z <sub>DBP</sub>	人数	Z <sub>SBP</sub>	Z <sub>DBP</sub>
男	12 602	0.46±1.05	0.42±0.96	571	0.62±1.13 <sup>a</sup>	0.74±0.93 <sup>a</sup>
女	13 880	0.45±1.08	0.43±0.98	1076	0.62±1.14 <sup>a</sup>	0.74±0.99 <sup>a</sup>

注:<sup>a</sup> P<0.001

### 讨 论

BMI和腰围均为判定肥胖的常用指标。然而BMI反映个体的脂肪总量和一般性肥胖,腰围则反映脂肪的聚集和腹型肥胖(中心型肥胖)<sup>[9,11]</sup>。即某个体采用BMI评价时处于正常范围,但采用腰围指标评价则显示腹型肥胖。Kovacs等<sup>[16]</sup>报告2007年布达佩斯7~15岁儿童正常体重腹型肥胖的检出率为3.66%(男性3.38%,女性3.92%)。本研究发现,在正常体重范围内的儿童少年中,5.86%的个体为腹型肥胖,其血压水平较高,应列为高风险儿童并实施相应的干预措施。这部分儿童少年如仅用BMI指标评价,其健康风险将被忽视。因此,不少学者建议BMI和腰围两项指标联合应用于肥胖及相关健康风险的筛查<sup>[16-18]</sup>。

目前仅有少数研究报告了儿童少年正常体重腹型肥胖与冠心病危险因素的相关性。Mokha等<sup>[19]</sup>报告正常体重腹型肥胖儿童的LDL-C、TG和胰岛素水平分别比正常腰围儿童高1.66、1.47和2.05倍,HDL-C水平低2.01倍。Kovacs等<sup>[16]</sup>报告正常体重腹型肥胖儿童的SBP和DBP均值分别比正常腰围儿童高6.0 mm Hg和2.6 mm Hg。本研究发现,山东省7~17岁正常体重腹型肥胖儿童少年的血压水平显著高于正常腰围儿童少年,与文献报告结果一致<sup>[16]</sup>。

本研究还发现,2010年山东省儿童少年超重肥胖率已达22.16%,相对于消瘦(5.37%),超重和肥胖已成为更突出的健康问题。结合儿童少年超重肥胖在全球范围内蔓延<sup>[20,21]</sup>和国内快速上升的流行趋势<sup>[22-25]</sup>,应引起高度关注并采取综合干预措施。

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