

Blood pressure of primary-school children of Eghbalieh city, Islamic Republic of Iran

A. Mahyar,¹ M. Ebrahemi,² A. Shahsavari³ and Y. Rahmani³

ضغط الدم لدى أطفال المدارس الابتدائية في مدينة إقبالية في جمهورية إيران الإسلامية
أبو الفضل مهبيار، مرتضى إبراهيمي، أحمد شهبسوار، يوسف رحمان

الخلاصة: تتعرف هذه الدراسة على الشرائح المئوية (مئينات) ضغط الدم الانقباضي والانبساطي ومعدل انتشار فرط ضغط الدم بين 789 من أطفال المدارس الابتدائية، ممن تتراوح أعمارهم بين 7 و12 عاماً في مدينة إقبالية، في جمهورية إيران الإسلامية. وقد وجد الباحثون أن وسطي الضغط الشرياني الانقباضي والانبساطي يزداد مع تقدم العمر لدى الجنسين. ولم يكن هنالك فرق يعتد به إحصائياً بين الأولاد والبنات بصورة عامة، غير أنه كان هنالك اختلاف يعتد به بينهم في 3 فئات عمرية. وكان معدل انتشار فرط ضغط الدم الانقباضي والانبساطي 6.5% لدى الأولاد و12.8% لدى البنات. وقد كان المعدل الوسطي للضغط الانقباضي والانبساطي لدى الأولاد والبنات من جميع فئات الأعمار أقل مما هو لدى سُلم القياس لفريق العمل الثاني المعني بمكافحة ضغط الدم لدى الأطفال.

ABSTRACT This study determined the percentiles of systolic and diastolic blood pressure and the prevalence of hypertension among 789 primary-school children aged 7–12 years in the city of Eghbalieh, Islamic Republic of Iran. Mean systolic and diastolic blood pressure increased with increasing age in both sexes. There was no significant difference between mean systolic pressure in boys and girls overall, but a significant difference was found between boys and girls in 3 age groups. The prevalence of systolic and diastolic hypertension overall was 6.5% and 12.8% respectively. The mean systolic and diastolic blood pressure of boys and girls in all age groups were significantly lower than the Second Task Force on Blood Pressure Control in Children scale.

Pression artérielle des enfants des écoles primaires de la ville d'Eghbalieh (République islamique d'Iran)

RÉSUMÉ Cette étude a déterminé les centiles de la pression artérielle systolique et diastolique et la prévalence de l'hypertension chez 789 enfants âgés de 7 à 12 ans scolarisés en primaire dans la ville d'Eghbalieh (République islamique d'Iran). La pression artérielle systolique et diastolique moyenne augmentait avec l'âge chez les deux sexes. Il n'existait pas de différence significative entre la pression systolique moyenne chez les garçons et les filles en général, mais il en existait une entre les garçons et les filles de trois groupes d'âges. La prévalence de l'hypertension systolique et diastolique chez les garçons et les filles était respectivement de 6,5 % et 12,8 %. La pression artérielle systolique et diastolique moyenne chez les deux sexes dans tous les groupes d'âges était significativement inférieure à celle définie par l'échelle de la Second Task Force on Blood Pressure Control in Children (Deuxième groupe de travail sur le contrôle de la pression artérielle de l'enfant).

¹Department of Paediatrics; ²Department of Cardiology, Qazvin University of Medical Sciences University, Qazvin, Islamic Republic of Iran (Correspondence to A. Mahyar: Abolfazl473@yahoo.com).

³General Practice, Qazvin, Islamic Republic of Iran.

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Introduction

Arterial blood pressure (BP) measurement in children is one of the most important tools in diagnosing their physical health. Through regular measurement and recording of BP, children affected with hypertension can be identified and, with proper treatment, serious complications may be prevented [1,2]. BP depends on cardiac output and peripheral vascular resistance. Various factors influence BP, including age, sex, weight, race, nutrition profile and environmental factors [1,2]. Because BP increases with increasing age, there is no fixed value for defining hypertension in children. Therefore to determine raised BP in children, standard curves such as the Second Task Force on Blood Pressure Control in Children (STF) scale must be used [2–4].

There are few data about blood pressure patterns and the prevalence of high blood pressure in Iranian children. A study conducted in the central part of the Islamic Republic of Iran revealed a significant difference between diastolic BP in 10–11-year-old girls and those of the STF scale [4].

Early identification of children at risk for hypertension is important to prevent serious complications. The present study aimed to determine the percentiles of systolic and diastolic BP and also the prevalence of hypertension among primary-school children aged 7–12 years in the city of Eghbalieh, Qazvin province.

Methods

The city of Eghbalieh has a population of around 35 000 with 6310 primary-school children aged 7–12-year-old. It is one of the cities of Qazvin province, located 160 kilometres west of Tehran. In this cross-sectional study the BP of 789 primary schoolchildren in the 7–12-year-old age

group were measured in a 2-month trial during November and December 2005. The sample of children was selected through a double-stage randomized sampling method. The study was conducted with the permission of the local education department. Children entered the study after their parents had given their consent by signing agreement forms.

Measurement of BP in the selected children was carried out in a quiet environment using a stethoscope and mercury sphygmomanometer with standard cuff suitable for age. The BP was calculated for 5th, 10th, 25th, 50th, 75th, 90th and 95th percentiles for the 6 age groups from 7–12-years old. A BP above the 95th percentile for age and sex was considered as hypertension. The results were further compared with the STF scale [2]. The data were analysed using SPSS and *t*-tests.

Results

Of a total of 789 children studied, 306 (38.7%) were males and 483 (61.3%) females. The mean systolic and diastolic BP in both sexes increased with increasing age (Table 1). There was no significant difference between the overall mean systolic BP of boys and girls.

However, a significant difference was found between the mean diastolic BP of boys and girls in 3 age groups: 7, 8 and 11 years (Table 1) ($P < 0.05$). There was a significant difference in mean systolic BP of boys and girls in all age groups compared with the STF scale ($P < 0.05$) (Table 1).

A significant difference was found when the mean diastolic BP of boys in all age groups was compared with the STF scale ($P < 0.05$). However, among girls, a significant difference was only found in 2 age groups: 9 and 10 years ($P < 0.05$) (Table 2).

Table 1 Age-specific percentiles of systolic and diastolic blood pressure in primary-school children in Eghbaliéh, Islamic Republic of Iran

Sex/age (years)	Mean	SD	Blood pressure (mmHg)						
			Percentile						
			5th	10th	25th	50th	75th	90th	95th
Systolic									
<i>Boys</i>									
7	96.8	8.0	82	88	90	95	105	110	110
8	96.5	8.9	80	85	90	95	100	108	115
9	99.8	11.1	85	90	90	100	105	120	120
10	101.1	8.3	90	90	95	100	110	115	115
11	104.0	11.3	85	90	95	103	110	120	125
12	107.5	14.4	90	95	100	105	110	120	140
<i>Girls</i>									
7	69.1	9.8	85	87	90	98	105	110	114
8	98.8	9.5	85	90	90	100	105	110	115
9	101.9	10.1	90	90	95	100	110	115	120
10	105.6	8.9	90	95	100	105	110	115	120
11	109.5	8.6	94	100	105	110	115	120	125
12	110.9	10.5	95	100	100	110	116	130	130
Diastolic									
<i>Boys</i>									
7	65.1	7.0	55	60	60	65	70	75	79
8	65.1	6.2	55	60	60	65	70	70	76
9	68.4	8.1	60	60	60	65	75	80	80
10	69.0	7.4	60	60	65	70	70	80	82
11	70.5	7.8	60	60	65	70	75	80	80
12	72.9	7.8	60	63	70	70	80	80	91
<i>Girls</i>									
7	69.1	8.5	60	60	60	70	75	80	84
8	69.9	8.9	60	60	60	70	75	80	85
9	70.1	8.2	60	60	60	70	75	80	85
10	71.9	7.5	60	60	70	70	75	80	87
11	74.2	6.5	64	65	70	75	80	80	80
12	74.1	8.3	60	62	70	70	80	89	90

SD = standard deviation.

A systolic BP greater than the 95th percentile (i.e. systolic hypertension) was seen in 5.2% of boys and 7.9% of girls, while a diastolic BP higher than the 95th percentile (i.e. diastolic hypertension) was found in 7.6% of boys and 18.1% of girls. The rate of systolic and diastolic hypertension in all children was 6.5% and 12.8%, respectively.

The lowest rate of systolic hypertension of the boys (0%) was observed in age groups 7 and 10 years old and the highest (11.5%) in age group 9 years old. The lowest rate of systolic hypertension in girls (4.0%) was in age group 8 years old and the highest (18.2%) in age group 12 years old. The lowest diastolic hypertension of boys (3.8%)

Table 2 Comparison of mean systolic and diastolic blood pressure of primary-school children in Eghbalieh, Islamic Republic of Iran with the Second Task Force on Blood Pressure Control in Children (STF) scale [2]

Sex/age (years)	Blood pressure (mmHg)		STF scale	P-value
	Mean	SD		
Systolic				
<i>Boys</i>				
7	96.8	8.0	111	< 0.05
8	96.5	8.9	112	< 0.05
9	99.8	11.1	113	< 0.05
10	101.1	8.3	115	< 0.05
11	104.0	11.3	117	< 0.05
12	107.5	14.4	119	< 0.05
<i>Girls</i>				
7	97.6	9.8	109	< 0.05
8	98.8	9.5	111	< 0.05
9	101.9	10.1	113	< 0.05
10	105.6	8.9	115	< 0.05
11	109.5	8.6	117	< 0.05
12	110.9	10.5	119	< 0.05
Diastolic				
<i>Boys</i>				
7	65.1	7.0	72	< 0.05
8	65.1	6.2	73	< 0.05
9	68.4	8.1	74	< 0.05
10	69.0	7.4	75	< 0.05
11	70.5	7.8	76	< 0.05
12	72.9	7.8	77	< 0.05
<i>Girls</i>				
7	69.1	8.5	70	> 0.05
8	69.9	8.9	71	> 0.05
9	70.1	8.2	73	< 0.05
10	71.9	7.5	74	< 0.05
11	74.2	6.5	75	> 0.05
12	74.1	8.3	76	> 0.05

SD = standard deviation.

was seen in age group 8 years old and the highest (11.5%) in age group 9 years old. The lowest diastolic hypertension in girls was in age group 10 years old (14.8%) and the highest (16.6%) in age group 7 years old.

Discussion

This study revealed that the average systolic and diastolic BP of primary-school children in the city of Eghbalieh was lower than the STF scale, and the prevalence of systolic and diastolic hypertension was 6.5% and 12.8%, respectively.

Few studies have been conducted regarding the BP status of Iranian children. In a study carried out in central Islamic Republic of Iran, there was a significant difference between the diastolic BP of 10–11-year-old girls compared with the standard [4]. Another study in the west of the country found that the pattern of BP of 6–12-year-old children was in accordance with the standard [5].

A variety of different studies have been conducted related to the prevalence of hypertension in children. Some reported a prevalence of 15.8% in boys and 8.7% in girls [6]. Uscátegui Peñuela et al. reported that the prevalence of systolic hypertension in boys and girls was 1.6% and 1% respectively [7]. Paradis et al. showed that 22% of boys and 12% of girls suffered systolic hypertension, while only 1% of children were affected with diastolic hypertension [8]. In another study carried out on 6–11-year-old primary-school children, the prevalence of hypertension was 5.4% in girls and 3.1% in boys [9]. In the study by Barba et al., 10% of boys and 14% of girls aged 6–11 years were affected with hypertension [10]. In a study of 4–6-year-old children in Iraq, the prevalence of systolic and diastolic hypertension was 1.1% and 0.6% respectively [11]. The prevalence of hypertension in Tunisian primary-school children was 9.2% in boys and 9.9% in girls [12].

In our study both systolic and diastolic BP was higher in girls than in boys. Some studies have shown the prevalence of hypertension was higher in males [4,5,7,8,13,14],

however, there are studies in which a higher hypertension was seen in females [10,12,13]. In contrast, Menghetti et al. reported that there was no difference between the sexes [15].

In our study the systolic and diastolic BP in both sexes increased with increasing age. The same finding was recorded in other studies [1,2,4].

Comparing our findings with other studies shows that the pattern of BP and the prevalence of hypertension in children varies throughout the world. This variation is related to factors such as weight, height, nutrition profile, race, stress, family history of essential hypertension, and environment [1,2,16]. Unfortunately, due to difficulties in collecting information, it was not possible for us to obtain data on factors known to influence BP and this was one limitation of our study. The higher level of BP in certain

age groups may be related to causes such as underlying disease, stress and obesity.

Conclusion

This study showed that mean systolic and diastolic BP among primary school children of Eghbalieh city was lower than the STF scale. The prevalence of systolic and diastolic hypertension in children was 6.5% and 12.8% respectively. Considering the high prevalence of hypertension in this region, regular measurement of BP is indicated.

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Diagnostic imaging

The goal of the WHO working area for diagnostic imaging (Diagnostic Imaging and Medical Devices; URL: http://www.who.int/diagnostic_imaging/en/) is:

- make safe and appropriate diagnostic imaging services available to all (universal coverage);
- advise, train, guide and support those working in the field, to develop and maintain safe and appropriate diagnostic imaging services (effective service delivery);
- promote the importance of safe and appropriate diagnostic imaging services starting from the planning level (sensitize policy makers).

Recent publications include: *Basics of radiation protection* and *The WHO manual of diagnostic imaging*.