

Frequency of hypertension among school-age children in Rafsanjan, Iran

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Abstract

BACKGROUND: Regular determination of blood pressure is very important in children, since early diagnosis of hypertension may reduce cardiovascular morbidity and mortality. This study was conducted to determine the frequency of hypertension among 7-12 year-old children in Rafsanjan during 2007.

METHODS: In this cross-sectional descriptive study, 2370 male and female school-age children (7-12 years old) were included using multistage sampling method. Their height and blood pressure were measured by a standard meter tape and a sphygmomanometer. The criteria of the American Society of Heart, Lung, and Blood were used for definition of hypertension. The collected data was analyzed by chi-square test and analysis of variance in SPSS₁₇.

RESULTS: The prevalence of hypertension among the studied children was 3.5%. There was a relationship between age and the rates of high systolic and diastolic pressure in both genders. The prevalence of hypertension among male and female subjects was 1.8% and 5.2%, respectively. The highest level of hypertension was among 12 year-old children. Moreover, 2.5% of boys and 5.1% of girls had interstitial blood pressure.

CONCLUSION: The frequency of interstitial blood pressure and hypertension in our participants was apparently lower than the rates reported by similar studies. This difference is might have been caused by utilizing the new and more accurate criteria determined by the American Society of Heart, Lung, and Hypertension in the present research.

Keywords: Incidence, Hypertension, Children, Rafsanjan

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Introduction

Due to high prevalence, reduced life expectancy, and hidden symptoms, arterial hypertension is an important medical problem. Increased prevalence of hypertension is a risk factor for cardiovascular diseases and related mortality.¹ Hypertension usually occurs in adults and is related with age, sex, weight, height, and race factors. However, it apparently does not solely depend on age as it can also affect children. In fact, the incidence of the disease in teenagers has been reported as about 15%.²

Primary hypertension is more often seen in late childhood and adolescence and is thought to be the cause of primary hypertension in adults.³ Although secondary factors are mostly responsible for hypertension in children younger than 10 years old, essential hypertension has also been detected in childhood.⁴ Based on percentile curves in previous studies, blood pressure of both boys and girls

increases from birth until the age of 18. Systolic and diastolic blood pressure are defined based on height percentile curves. Normal arterial blood pressure for height percentile curve varies from 5 to 95 percent. Without taking a child's height into account, sometimes normal blood pressure is considered as hypertension.^{5,6} Children with systolic blood pressure above the 90th percentile have three times higher risk of systolic hypertension after puberty than those with systolic blood pressure in the 50th percentile. The risk will also be doubled in children with diastolic blood pressure in the 90th percentile.⁷

In 1987, the American Heart, Lung and Blood Association evaluated the distribution of blood pressure in 70,000 healthy 1-17 year-old children and proposed blood pressure norms. The norms did not correlate with age, sex, race, or nationality.⁶ In 1996, a new analysis of these data led to a new standard for measuring blood pressure based on

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children's height percentile. This standard is more accurate than blood pressure classification based on body mass because it considers higher normal blood pressure as height and age increase.⁶ Children's blood pressure can hence be classified as normal, interstitial, and high.⁶ Numerous studies in Iran and other countries have assessed the prevalence of hypertension in children. For instance, a study in Tehran (Iran) in 1980-81 suggested the prevalence of hypertension to be 9% among 2573 boys and girls aging 7-12 years old.³ Another study on 5917 male and female students in Qazvin (Iran) reported the prevalence of hypertension to be 6.6% in girls and 2.7% in boys. The highest prevalence of complication was seen in 12-year-old girls and 10-year-old boys.⁷ The children's blood pressure was almost matched with their height and weight.³

A study on school children in Quetta, Pakistan showed changes in blood pressure to depend on age.⁵ A research on 2,073 Indian students (5-14 years old) indicated changes in blood pressure to be influenced by age, climate, and dietary factors.⁸ According to another study, blood pressure of Arab children residing in Israel was related with age, race, and body mass index (BMI). Moreover, Israeli children had lower blood pressure than Arab children.⁹ Studies in European^{10,11} and American populations¹² have reported systolic blood pressure to be associated with children's height. Bartosh and Aronson showed the role of race, geographic region, and height in determining blood pressure. In fact, black subjects had higher systolic and diastolic blood pressure than white individuals.¹²

While childhood blood pressure control is of high importance, the majority of cases of hypertension in children and adolescents are asymptomatic or with nonspecific symptoms. Since blood pressure in childhood and adulthood are absolutely related, we conducted this study to measure blood pressure in 7-12 year-old children in Rafsanjan, Iran.

Materials and Methods

This cross-sectional descriptive study used multistage random sampling to select 2,370 students from schools in Rafsanjan, Iran. The subjects were selected from five clusters (north, south, east, west, and center) of the city. None of the subjects were taking a certain medication and they were asked not to exercise or have vigorous activity from an hour prior to measurements. All steps of the study were explained to the students to reduce their anxiety.

First, demographic characteristics of the

participants were recorded. Afterward, the students were asked to take off their shoes and stand with their buttocks and shoulders touching the wall. Their height was then measured using rulers and meter tapes with accuracy of one centimeter.

The students' sitting blood pressure was measured in the health room of schools by six trained individuals using an analogue mercury sphygmomanometer (ALPK2, Japan). Measurements were performed under standard conditions twice a week. If a child had high blood pressure in both measurements, his/her family was informed for further follow-ups. Children with high blood pressure in only one measurement were not included.

We defined hypertension based on the new standard of the American Heart, Lung, and Blood Association in 1996. Therefore, children's blood pressure was categorized according to their height percentile. In other words, as normal blood pressure of children increases by increasing age and height, normal (blood pressure < 90th percentile), interstitial (90th percentile < blood pressure < 95th percentile), and high blood pressure (\geq 95th percentile) were thus defined based on age, sex, and height.⁶

The collected data was analyzed by descriptive statistics, chi-square test, and analysis of variance (ANOVA) in SPSS for Windows 17.0 (SPSS Inc., Chicago, IL, USA).

Results

Among the 2370 studied subjects, 1,204 were boys and 1,166 were girls. Overall, 83 students (3.5%) had hypertension and the complication was more common in girls than in boys (5.2% vs. 1.8%). Moreover, 90 students were suspected to have hypertension or interstitial blood pressure (5.1% of girls vs. 2.5% of boys). In both sexes, hypertension had the highest prevalence among 12-year-olds.

The mean systolic blood pressure in 7-12 year-old girls was 95.0, 100.2, 101.0, 106.0, 106.0, and 111.0 mmHg, respectively. The corresponding values among boys were 99.5, 98.2, 100.0, 104.0, 103.0, and 104.0 mmHg. The mean diastolic blood pressure in 7-12 year-old boys was 58.7, 58.0, 61.0, 64.9, 62.2, and 63.0, respectively. The corresponding values in girls 57.0, 60.4, 63.0, 67.0, 67.0, and 72.0, respectively. Hence, we can argue that blood pressure rises as age increases. This increase was higher in girls than in boys ($P < 0.001$). Significant relations between height and systolic and diastolic pressures were found in both sexes ($P < 0.05$).

However, children's blood pressure was not significantly related family history of hypertension,

physical activity, and number of children in family ($P > 0.05$).

Discussion

We found the overall prevalence of hypertension in children to be 3.5%. Previous studies have reported rates from one to nine percent.^{3-5,8-14} The prevalence of this complication among children has been calculated as 6.9% in Qazvin³ and 9.0% in Tehran (two cities in Iran).^{3,13} Therefore, hypertension was less prevalent in our study than in Tehran and Qazvin.

Although we found hypertension to be about three times more common among girls than in boys, the contrary was reported in Qazvin.³ In addition, while interstitial blood pressure was seen in 5.1% of girls and 2.5% of boys in the present study, the complication was found in 6.9% of girls and 6.1% of boys in Qazvin.³ Using the standard provided by the American Heart, Lung, and Blood Association can justify lower rates of hypertension and interstitial blood pressure in our study compared to previous research. In fact, while other studies determined blood pressure based on weight, we used height and sex percentiles to calculate normal blood pressure.

In the present study, increased age was associated with higher systolic and diastolic blood pressure in both boys and girls. However, girls' blood pressure increased significantly more than boys'. Similarly, in a study on 1,061 7-11 year-old children in Tehran (Iran), there was a significant, positive relationship between sex and systolic and diastolic blood pressure. Significant relations were also found between height and systolic and diastolic blood pressure in both sexes.¹³ Consistent findings were suggested in a study in rural areas of Shahrekord.¹⁴ The relation between height and systolic blood pressure in children was also found by studies in European^{10,11} and American populations.¹² Bartosh and Aronson confirmed the relations between blood pressure and height, race, and geographical regions.¹²

In overall, the study results indicated some discrepancies and similarities to other research. These findings suggest that systolic and diastolic blood pressure are higher in girls over 10 years old than in boys of the same age. Consistent results were reported by studies in Tehran¹³ and Shahrekord.¹⁴ The difference between boys and girls can be caused by factors such as early onset of puberty and high level of sex hormones in early puberty in girls.

On the other hand, in the 90th and 95th

percentiles of children aging 7-8 years old, systolic and diastolic blood pressure of both sexes were 3-8 mmHg lower in Rafsanjan than in the US.⁶ Similarly, blood pressure of children in Rafsanjan children was lower than American children in other percentiles and age groups.⁶ Possible factors such as genetics, geographic region, race, diet and physical activity are effective in this regard.

Considering the difference in blood pressure of Iranian children and children of other communities, specific standards are required in determining the level of blood pressure in children. Such standards will undoubtedly facilitate hypertension treatment and prevention among children. More accurate measurement of blood pressure in all children should also be performed.

Conclusion

It seems that hypertension and interstitial blood pressure were less prevalent among the children in the present study than in previous research. This difference could have been caused by different standards used in various studies. The new standard proposed by American Heart, Lung, and Blood Association (and used in the current study) is slightly more accurate than classifications based on BMI.

Conflict of Interests

Authors have no conflict of interests.

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