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The Prevalence of Hypertension and its Related Factors in Children Aged 7 to 12 Years in Larestan (South Fars Province, Iran)

Ziba Moravej [1], Gholamali Haghighat [2], Aboubakr Jafarnezhad [3], Atefeh Raoufi [4], Sanaz Atef [5], Azizallah Dehghan [5, 6] *

1. Department of Health, Larestan University of medical sciences, Larestan, Iran
2. Department of Environmental Health Engineering, School of Health, Jiroft University of Medical Sciences, Jiroft, Iran
3. Department of Epidemiology, Student Research Committee, Shiraz University of Medical Sciences, Shiraz, Iran
4. Department of Nursing, Larestan University of medical sciences, Larestan, Iran
5. Noncommunicable Diseases Research Centers, Fasa University of Medical Sciences, Fasa, Iran
6. Department of Social Medicine, School of Medicine, Fasa University of Medical Sciences, Fasa, Iran

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Corresponding Author:
Azizallah Dehghan
dehghan.aziz@yahoo.com

ABSTRACT

Background: Childhood hypertension can have serious consequences for children, especially during their adulthood. This study aimed to determine the prevalence of hypertension and its related factors in children aged 7 to 12 years in Larestan (Iran).

Methods: In this cross-sectional study, 1110 students from 7 to 12 years old in Larestan were enrolled in the study using cluster sampling. In order to collect educational data, 10 girls' primary schools and 10 boys' primary schools were randomly selected from all the girls' and boys' primary schools. Then, considering that each school has different number of students, 55 students of each school were randomly selected. Students' blood pressure was measured as standard. Their personal information was also recorded in a checklist. A checklist containing demographic information, factors and variables that affect the prevalence of hypertension in children aged 7 to 12 years was used. To collect information, a checklist was used that included demographic information such as age, gender, and place of residence. Also, in order to identify factors and variables effective in the prevalence of high blood pressure (HBP), tools such as sphygmomanometer and other risk factors including obesity, type of diet, physical activities, and body mass index (BMI) were used.

Results: The mean age of girls was 9.11 ± 1.53 and boys were 9.19 ± 1.52, which did not differ significantly from the statistical point of view. The prevalence of pre hypertension was 6.03% (95% CI: 4.71-7.60) and the prevalence of hypertension was 4.14% (95% CI: 3.05-5.49). Systolic and diastolic blood pressure has direct relation with height and weight of children. Diastolic blood pressure also had a higher prevalence in girls ($P < 0.001$).

Conclusion: Overweight and obesity as a moderate aggressive factor were significantly associated with blood pressure. Also, the prevalence of HBP in children was significant, and it is necessary to pay attention to it in childhood. Moreover, hypertension cases should be identified and treatment should start faster for the affected person to prevent the adverse consequences in the future.

Keywords: Childhood Hypertension, Obesity, Body Mass Index, Iran

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Introduction

All people have blood pressure and basically need it, but high blood pressure (HBP) or hypertension is a common disease that is usually asymptomatic and if there is no action, it will have fatal consequences; therefore, it is named as silent killer (1). It can be said that the only way to identify HBP is to check it, which is a simple, quick, and painless method. If a person has HBP, it can usually be controlled by lifestyle modification, prescribing, and medication (2).

HBP is also seen in infants, children, and adolescents, with one in every 25 teenagers having HBP. Although hypertension is more prevalent in adults, it has an increasing trend in childhood due to increased obesity (3). Studies have shown that rapid increase in BMI is associated with HBP and long-term health risks (4, 5).

A study reported that children who are more likely to have gestational diabetes are more likely to have HBP due to their weight gain (4). It has also been shown that a faster increase in BMI in the first six months after childbirth and during preschool can lead to an increase in blood pressure in the middle of childhood (6).

Population surveys have shown HBP in adolescence with childhood hypertension (7), body size and weight (height and weight increase from childhood to adolescence) (8). In a survey on 2575 girls and boys aged 10 to 17 years from Tehran in 2003, it was shown that the prevalence of hypertension in adolescence in Tehran is significant (9). In a study on 1195924 Tehrani students during 2008-2009, there was a significant direct correlation between age, weight, and height of children with systolic and diastolic blood pressure (10).

On the other hand, the results a study in Birjand (Iran) in 2012 showed HBP in these children and obesity control was proposed as a preventive measure (11). Dormanesh et al.'s study also showed that one of the ways to prevent HBP in children is to control weight and prevent obesity (12). Chang et al. confirmed that one of the symptoms of HBP in children is obesity (13). Also, in another study conducted by Don et al., they considered obesity as a risk factor for HBP in children and considered obesity prevention as one of the factors that control HBP (14).

Since timely recognition and treatment of hypertension prevents its complications, and also with regard to this fact that controlling and treating hypertension in children is more likely than adults, the American Academy of Medicine emphasizes for screening hypertension in children, which requires regular blood pressure measurements every six months, starting at age three, and then continues each Year. In fact, timely recognition and prevention of hypertension in order to modify life expectancy is one of the primary health care needs of children (7).

Given the complications of HBP in adolescence and its relation with obesity and childhood hypertension, and also the ability to control and prevent it, this study aimed to determine the prevalence of hypertension and related factors in children aged 7 to 12 years in Larestan to improve the whole community health, reduce the burden of the disease and prevent disease progression in the same early age.

Methods

The present study was cross-sectional, descriptive, and analytical. The statistical population of the study was all students aged 7 to 12 years in Larestan, and 1110 of them were selected through multi-stage multidisciplinary schools. In this study, 10 girls' primary schools from all girls' primary schools and 10 boys' primary schools were randomly selected from boys' primary schools. In each school, 55 students were randomly selected.

The criteria for entering the study were ages 7 to 12 years and student and parent's satisfaction. Students with renal disease and congenital heart disease were also excluded. Data were collected by checklist, including blood pressure, height, weight, age, gender and parental education level. A checklist with two sections was used to collect information. The first part contained demographic information, and the second part contained

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information on factors and variables affecting the prevalence of blood pressure in children aged 7 to 12 years old. In the first part, demographic information included age, gender, and place of residence. In the second part, the checklist of factors and variables affecting the prevalence of HBP including obesity, type of diet, physical activity and body mass index (BMI) was used.

After collecting the information in the checklist, the data were entered into the software and the relevant analyses were done.

To measure blood pressure, a normal barometric device suitable for children was used. During the sampling, two pressure gauges were used which were calibrated daily.

A medical scale was used to measure the weight and to measure the height, a meter strip was used. All measuring tools were regularly checked during the implementation stages. The weight of people, without shoes, was measured with comfort, and height measurements were made without shoes and in standing position.

During the study, white medical dressing was not used. In order to reduce the interpersonal error, each type of measurement was done by one person. To minimize the effect of daily oscillations on children's blood pressure, measurements were carried out at 8-9 in the morning, at a time interval of 30 minutes and eventually averaged. Based on blood pressure classifications in pediatric medicine, HBP was determined. If the measured blood pressure was higher than normal, it would be divided into 3 classes of pre-hypertensive blood, grade 1, and 2 hypertensions.

Descriptive statistics of mean and standard deviation were used to describe the quantitative and frequency variables and relative frequency for describing qualitative variables. Chi-square and Spearman correlation coefficients were used to determine the relationship between blood pressure and other variables. The SPSS 16 software was also used to analyze the data.

Results

In this study, 1110 children aged 7 to 12 years were selected. During the study, 18 people did not participate in the study, which was replaced with other people. Fifty percent of the participants were boys and the rest were girls (12).

The prevalence of pre hypertension was 6.03% (95% CI: 4.71-7.60) and the prevalence of hypertension was 4.14% (95% CI: 3.05-5.49). The demographic characteristics of the participants in the study and pre-compression prevalence of blood and hypertension based on the variables of gender, place of residence, age, and BMI of students are shown in Table 1.

Table 1 shows the relationship between the variables of age, sex, place of residence, and BMI with HBP. Age and BMI variables had a significant relationship with HBP.

The mean age of girls was 9.11 ± 1.53 and boys were 9.19 ± 1.52, which did not differ significantly from the statistical point of view.

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Table 1. Prevalence of hypertension in children aged 7-12 years by demographic variables in Larestan (south Fars province, Iran) in 2018

	Variable	N (%)	Prehypertension		Hypertension		P-Value
			N	Prevalence (95%CI)	N	Prevalence (95%CI)	
Gender	Male	555 (50)	29	5.22 (3.52- 7.42)	24	4.33 (2.79- 6.36)	0.510
	Female	555 (50)	38	6.84 (4.89- 9.27)	22	3.96 (2.51- 9.27)	
Place of residence	Urban	585 (52.7)	43	7.35 (5.37-9.77)	26	4.44 (2.92- 6.44)	0.124
	Rural	525 (47.3)	24	4.57 (2.95- 6.72)	20	3.81 (2.34-5.82)	
Age	7	164 (14.8)	5	3.05 (0.99- 6.97)	13	7.92 (4.29-13.17)	0.001
	8	250 (22.5)	14	5.6 (3.09- 9.21)	6	3.4 (0.88- 5.15)	
	9	252 (22.7)	12	4.76 (2.48- 8.17)	6	2.38 (0.87-5.11)	
	10	157 (14.1)	14	8.91 (4.96-14.51)	3	1.91 (0.39-5.48)	
	11	173 (15.6)	18	10.4 (6.28-15.94)	8	4.62 (2.01- 8.91)	
	12	114 (10.03)	4	3.51 (0.96- 8.74)	10	8.77 (4.28-15.54)	
BMI	< 18.5	845 (76.1)	34	4.02 (2.80-5.57)	31	3.66 (2.51-5.17)	**<0.001****
	18.5-25	222 (20)	21	9.45 (5.95-14.58)	10	4.50 (2.18-8.12)	
	25 >	43 (3.9)	12	27.9 (15.32-43.66)	5	11.62 (3.88-25.08)	
Total		1110	67	6.03 (4.71-7.60)	40	4.14 (3.05-5.49)	-

Comparison of systolic and diastolic blood pressure variables in the subgroups of gender, place of residence, age, and BMI variables are shown in Table 2. Systolic blood pressure in the students had a significant relationship with gender, place of residence, age, and BMI. Diastolic blood pressure, however, was related only to age and BMI. Also, systolic and diastolic blood pressures had a significant correlation with BMI, with a correlation coefficient of 0.149 and 0.134, respectively. Table 3 shows the results of logistic regression, which shows that BMI had a significant relationship with HBP.

Table 2. Compare the mean level of systolic and diastolic blood pressure by demographic variables in Larestan (south Fars province, Iran) in 2018

Variable		Systole		Diastole	
		Mean ± SD	P- Value	Mean ± SD	P- Value
Gender	Male	92.44 ± 11.58	0.031*	59.26 ± 7.74	0.790*
	Female	90.80 ± 13.64		59.13 ± 9.01	
Place of residence	Urban	92.53 ± 10.17	0.023*	59.68 ± 7.77	0.071*
	Rural	90.81 ± 14.52		58.76 ± 8.89	
Age	7	88.09 ± 11.11	< 0.001**	55.89 ± 8.39	< 0.001**
	8	88.70 ± 12.67		58.58 ± 7.71	
	9	89.23 ± 53.09		59.03 ± 8.20	
	10	95.11 ± 10.15		58.92 ± 8.28	
	11	94.54 ± 12.82		61.07 ± 8.72	
	12	99.21 ± 11.57		63.20 ± 7.73	
BMI	<18.5	90.89 ± 11.92	< 0.001**	58.65 ± 8.24	< 0.001**
	18.5-25	92.95 ± 14.49		60.32 ± 8.51	
	25 <	99.07 ± 14.23		64.19 ± 8.52	
Total					

BMI: Body mass index; SD: Standard deviation
* Independent sample t test
** One-way ANOVA

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Table 1. Results of independent variable logistic regression

	B	S.E.	Wald	Sig.	OR	95% C.I. for OR	
						Lower	Upper
Age	.068	.066	1.052	.305	1.070	.940	1.219
Gender	- .135	.203	.442	.506	.874	.587	1.301
Place of residence	- .239	.210	1.291	.256	.788	.522	1.189
BMI	.857	.156	30.210	.000	2.356	1.736	3.199
Constant	- 3.053	.527	33.522	.000	.047		

Discussion

Childhood hypertension can be an important risk factor for cardiovascular diseases in adulthood and should be given priority. HBP, if not treated, causes many complications in vital organs of the body such as the kidneys, the brain, the eyes and the heart, causing disability, death, and high costs to the community. On the other hand, the disease can be controlled and by reducing and controlling it, the complications of this disease will be significantly reduced (14).

In this study, the prevalence of prehypertension was 6.03% and HBP was 4.14%. The results of the studies conducted by Mehr Alizadeh et al. in Semnan (13), Birjand (11), and Salem et al. in Rafsanjan (14) confirmed the findings of the present study. However, studies conducted in Ilam by Mohammadi (15) and Klishadi (16) were not consistent with the findings of the present study. The difference might be due to the different sample size of the studies, different target group, and time frame of the study.

In a cohort study by Lo et al. in California, 12.7% of children were in the pre-hypertensive stage and 4.5% had hypertension (17). The study of also et al. in Nigeria reported that 3% of children had hypertension (1). Different values of the prevalence of hypertension in various studies can be due to ethnicity, lifestyle, number of measurements, and blood pressure calculation methods in the prevalence of hypertension in different societies and cities.

In this study, girls' systolic blood pressure was significantly higher than boys', which was in line with the study by Salem in Rafsanjan (17). In the study of Kelishadi, the prevalence of hypertension in boys and girls was not significantly different (16). In the study of Mohammadi in Ilam, the prevalence of hypertension was higher in girls than in boys (16). Perhaps the prevalence of hypertension in girls is higher than boys which may be due to higher prevalence of obesity in girls (18).

The prevalence of hypertension in this study was directly correlated with height and weight variables. The results of the study showed that the prevalence of hypertension in obese and normal children was 30.7% and 8.4%, respectively (18), in the study of healthy children in Rafsanjan (14), Iran.

In the study of Moradmand et al. (19), there was a very strong relationship between weight and blood pressure. In a study in Tehran, 4.8% of girls and 3.5% of boys had HBP, and there was a significant direct correlation between age, weight, and height and BMI with systolic and diastolic blood pressure.

In this study, BMI was the most important factor that had a significant relationship with systolic and diastolic blood pressure and also the prevalence of hypertension. This association was also observed in the study of Also et al. (20). In this study, the correlation coefficient between BMI and systolic blood pressure was 0.44 and diastolic blood pressure was 0.38.

In the study of Ximena urrutia-Rojas (21) in Texas, the prevalence of hypertension was 38.3% in overweight people and was significantly different from normal ones (12.8%). In the study of Spinosa et al. (10), there was a significant correlation between systolic blood pressure (r = .354) and diastolic (r = 0.227). Studies of Moradmand et al. in Tehran (19) and Basirat Nia et al. in South of Iran reported a significant correlation between BMI and systolic and diastolic blood pressure (18).

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Conclusion

Hypertension in children should be taken into consideration and its consequences in adulthood should be prevented. Children's screening for blood pressure is also necessary. Considering the fact that overweight and obesity as a moderately invasive factor have a significant relationship with blood pressure, programs should be developed to change lifestyle and thereby prevent weight gain in children.

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Competing interests

The authors declare that they have no competing interests.

Authors' contributions

A. D. developed the original idea, Z. M. gathered data and entered them into Software, A. J. analyzed the data, S. A. contributed to the development of the prepared manuscript, A. R. wrote the manuscript, Gh. H. reviewed and corrected the article, A. J. submitted the article, and A. D. performed final review and approval for submission.

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