



# The Prevalence and Etiology of Childhood Hypertension In Turkey

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This study assesses the prevalence and etiology of childhood hypertension and whether normative data obtained by Second Task Force in USA<sup>1</sup> is applicable to pediatric population in Turkey. 8,820 children (4,141 male 47 %, 4,679 female 53%) aged 7-16 years who are students of 15 primary schools of Malatya in Turkey, were studied between February 1995 and September 1995. The child accepted as hypertensive when the blood pressure is at least above 95<sup>th</sup> percentile rank for age and sex. Medical history, physical examination and laboratory studies were performed. Hypertension was detected in 53 (0,6%) of 8,820 children. 32 (60,4%) were female and 21 (39,6%) male. In 44 children of 53 hypertension the etiological investigations carried out. In 8 (18,2%) patients the etiological factors could be detected. Hypertension causes were renal in 6 (13,6%) patients and in 2 (4,6%) cases endocrine. In 36 (81,8%) cases no etiological factor could be found, but family history of essential hypertension in 11 (30,5%) detected. In this group 22 of 36 children had obesity. As a conclusion the prevalence of hypertension in 7-16 age group is 0,6% in our district. 81,8% of hypertensive children have essential hypertension. Essential hypertension is frequently (61%) associated with obesity.

**Key words:** Childhood, Etiology, Hypertension, Prevalence

## Türkiye’de Çocukluk Çağı Hipertansiyonun Prevalans ve Etiyolojisi

Bu çalışma, çocukluk çağındaki hipertansiyonun prevalans ve etiyolojisini belirlemek ve normal veri olarak kabul edilen Amerika’daki “Second Task Force” değerlerinin<sup>1</sup> Türk popülasyonuna uygunluğunu ortaya koymaktadır. Şubat 1995-Eylül 1995 tarihleri arasında Türkiye Malatya ilindeki 15 ilköğretim okulunda öğrenci, yaşları 7 -16 arası olan 8820 çocuk (4141 erkek [%47], 4679 kız [%53]) çalışmaya alındı. Yaş ve cins persantiline göre kan basıncı değerleri %95’in üstünde olan çocuklar hipertansiyon olarak kabul edildi. Anamnez, fizik muayene ve laboratuvar çalışmaları yapıldı. 8820 çocuğun 53’ünde (%0,6) hipertansiyon tespit edildi. Bunların 32’si (%60,4) kız, 21’i (%39,6) erkek idi. 53 hipertansif çocuğun 44’ünde etyolojik araştırma yapıldı. Sekiz hastada (%18,2) etyolojik faktör saptandı. Altı hastada (%13,6) renal neden ve iki hastada (%4,6) endokrin neden saptandı. 36 hastada (%81,8) herhangi bir etyolojik faktör bulunamadı ancak 11 hastanın (%30,5) aile öykülerinde esansiyel hipertansiyon mevcuttu. Bu grupta 36 hastanın 22’si şıman idi. Sonuç olarak bizim bölgemizde 7-16 yaş arası hipertansiyon prevalansı %0,6 idi. Hipertansif hastaların %81,8’inde esansiyel hipertansiyon mevcuttu. Esansiyel hipertansiyona sıklıkla (%61) obesite eşlik etmekteydi.

**Anahtar kelimeler:** Çocukluk çağı, etyoloji, hipertansiyon, prevalans

Hypertension is diagnosed when systolic and/or diastolic blood pressure values derived by finding the averages of three measurements are either at 95 percentile rank or above according to age and sex. The incidence of childhood hypertension is not precisely known. The prevalence of hypertension in children is in the range of 1 % in an unselected pediatric population.<sup>2-6</sup> Both incidence and prevalence of hypertension are affected by the normodative criteria. For using criteria of a population which is different than study population, criterias must be controlled whether they are applicable to that population. In this study one of the aims was to check if the normodative data proposed by the Second Task Force in United States is applicable to Turkish children for making diagnosis of hypertension. Also we aimed to compare the etiology of the hypertension with literature.

Hypertension is categorized as essential (primary) and secondary. In recent publications, it is reported that more than 50 percent of high blood pressure in adolescence is essential.<sup>7</sup> The second most frequent cause of hypertension in this age group is renal parenchymal or renovascular.<sup>8,9</sup>

In younger age groups, though, secondary hypertension is more common and is due to renal, cardiovascular and endocrine diseases the concordance between blood pressure and body weight has been recognized for a long time.<sup>10-12</sup> Obesity is an important risk factor in the development of systemic hypertension.<sup>8, 9</sup> Most adolescents with essential hypertension are obese. Positive family history for hypertension or obesity in an adolescent strengthen the diagnosis of essential hypertension.<sup>8,9</sup>

## MATERIALS AND METHODS

The population of this study were students of 15 primary schools of Malatya district, aged 7-16 years (n=8,820) The schools were selected randomly and all students of selected schools had been included into study between February and September 1995. 47 percent were male (n=4,141) and 53 percent were female (n=4,679). Blood pressures were measured with aneroid manometer in the duration in sitting position after the child rested for 10 minutes with a blood pressure cuff covering two thirds or more of the upper arm of child. Measurements were repeated at 3 different times. The child was considered hypertensive if averages of three systolic and/or diastolic blood pressure values were found at 95 percentile rank or above according to normative data obtained by the Second Task Force in United States.<sup>1</sup>

Detailed histories pertaining to etiology were taken from children diagnosed as hypertensive and their physical examination was made. Blood urea, creatinine, electrolytes, urinalysis and urine cultures were evaluated. Intravenous pyelography, voiding cystourethrography, abdominal ultrasound, CT and thyroid hormone findings were evaluated in some of the cases. For obesity, body mass indexes (BMI) were calculated by the formula: Body weight in kilograms/(height in metres)<sup>2</sup> (50. percentile weight/(50. percentile height)<sup>2</sup>) Children with BMI's over 120% were considered obese.

## RESULTS

Hypertension was detected in 0.6 percent (n=53) of children. 60.4 percent (n=32) of them were female and 39.6 percent (n=21) were male. Girl to boy ratio was 1.5. In our study childhood hypertension prevalence was found as 0.6 percent. 83 percent of (n=44) children went through an etiological investigation. 9 children did not admit to the hospital after request to evaluate the etiology of hypertension. Averages of systolic (SBP) and diastolic blood pressure (DBP) values of hypertensive children are shown in Table 1.

18.2 percent (n=8) of children had secondary hypertension (Figure 1). 13.6 percent of them had renal etiology. 2.3 percent (n=1) of them had chronic renal insufficiency, 4.6 percent (n=2) had 1-2<sup>o</sup> vesicoureteral reflux 6.8 percent (n=3) had chronic pyelonephritis and 4.6 percent (n=2) hyperthyroidism (Table 2). 81.8 percent (n=36) children had essential hypertension (Figure 1). 50 percent (n=22) of them were obese according to their BMI's and in 16 percent (n=7) of them positive family history for

**Table 1.** Means of Systolic (SBP) and Diastolic Blood Pressure (DBP) Values of Hypertensive Children (n=44), Turkey, February-September 1995

Age (Years)	Sex (M/F)	Number (n)	Mean SBP (mm Hg)	Mean DBP (mm Hg)
7	M	4	132.5	77.5
	F	5	128	73
8	M	6	132.5	78
	F	2	131.5	90
9	M	4	129	79
	F	1	155	100
10	F	1	130	70
11	M	2	147.5	75
	F	5	138	85
12	M	2	147.5	67.5
	F	3	140	87.5
13	M	2	135	87.5
	F	4	145	83
15	F	2	137.5	76.5
16	F	1	170	90

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**Table 2.** Etiology of primary and secondary hypertension in children, (n=8820), Turkey, February-September 1995.

Primary (Essential) Hypertension 36 (%81.8)				Secondary Hypertension 8 (%18.2)			
OBESE 22 (%50)		NONOBESE 14 (%31.8)		RENAL Etiology 6 (%13.6)		ENDOCRINE Etiology 2 (%4.6)	
Obesity 15 (%34)	Obesity + Family history 7 (%16)	Family history 4 (%9.1)	Unknown etiology 10 (%22.7)	Chronic pyelonephritis 3 (%6.8)	Vesico ureteral reflux 2 (%4.6)	Chronic renal insufficiency 1 (%2.3)	Hyperthyroidism 2 (%4.6)

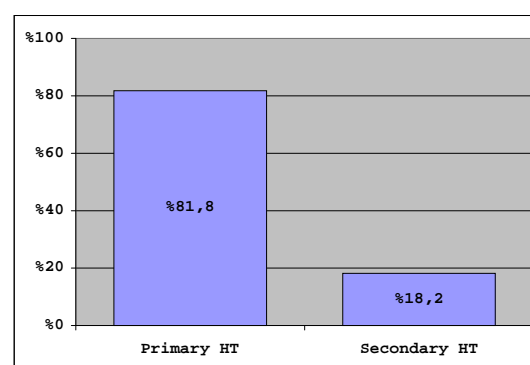
hypertension accompanied obesity. 14 children were not obese while 4 of them had positive family histories for hypertension and 10 of them did not have any predisposing factor (Table2).

### DISCUSSION

Though the prevalence of hypertension is definitely lower in children than in adults, it is not as rare as it is thought either. Screening different populations for normal blood pressure averages, studying the upper margins of blood pressure ranges according to age since it is known to rise by age and diagnosing hypertension by more than measurement will certainly be a healthier approach in providing an accurate hypertension prevalence.<sup>1,3</sup>

Rames et al. diagnosed hypertension in 0.6 percent (n=41) out of 6,672 primary school children.<sup>5</sup> The prevalence of hypertension was found as 0.6 percent in our study which was concordant with literature. It is claimed that hypertension prevalence varies among population and this is related to race and dietary habits but study population must also be under consideration that a considerably higher prevalence rate may be found in a selected population, e.g. in children hospitalized for various reasons or attending an out patient clinic or when using another definition of hypertension. From this study results it can be sad that normative data obtained by Second Task Force in United States also applicable to pediatric population in Turkey among unselected population out of the hospital.

Factors underlying secondary hypertension are more common in children and adolescents than adults; however, primary or essential hypertension is more frequent in the adolescent group.<sup>7</sup> Renal diseases are the major cause of secondary hypertension in children followed by cardiovascular and endocrine diseases.<sup>10</sup> Renal damage caused by hypertension and hypertension caused by previous renal disease altogether count for the higher prevalence of renal



**Figure 1.** Etiology of hypertension in children (n=8,820), Turkey, February-September 1995

disease in the hypertension population. In our study, 18.2 percent (n=8) out of 44 hypertensive children had secondary hypertension. 13.6 percent (n=6) of them had renal while 4.6 percent (n=2) had endocrine pathologies. Rames et al. has reported 5 children with secondary hypertension out of 41.<sup>5</sup>

The prevalence of childhood essential hypertension has been reported as 5-80 percent.<sup>3,7</sup> In this study, 81.8 percent (n=36) out of 44 hypertensive children were found to have essential hypertension which was concordant with literature. Hypertension positive family history or obesity especially in adolescents support the diagnosis.<sup>10</sup> Genetic predisposition is known to play a role in the development of essential hypertension.<sup>13</sup> In this study, 11 (25.1 percent) out of 36 essential hypertensive children and sympathetic nerve system sensitivity to stress is augmented in these people.<sup>14</sup> Other authors, however assumed that renal sodium excretion is impaired.<sup>15</sup>

The role of dietary sodium, potassium, calcium and magnesium in childhood hypertension has been investigated in many studies, we still lack definite data.<sup>16,17</sup> It is also thought that a carbohydrate, protein and saturated fat rich diet may cause

cardiovascular diseases and result in hypertension later in life.<sup>16,17</sup>

Obesity in childhood is an important risk factor for future cardiovascular diseases.<sup>18</sup> Becque et al. report that 80% of obese children have high systolic or diastolic blood pressure values.<sup>19</sup> Rames et al. found out that 23 (56%) out of 41 hypertensive children had obesity.<sup>5</sup> In our study 50 percent (n=22) of hypertensive children had obesity which was remarkable. This probably results from regional dietary habits that cause a lot of fat and carbohydrate conception.

The prevalence of childhood hypertension we report is concordant with literature; therefore we claim that the number of cases we studied in Malatya is representative of the pediatric population and racial differences of the children are not as important as other factors. And also normadative data obtained by the Second Task Force in United States are applicable to the pediatric population in Turkey.

Hypertension which is an important community health problem and a risk factor for atherosclerosis and coronary cardiac diseases and obesity which predisposes to hypertension should be diagnosed and the necessary precautions be taken as early as possible. Blood pressure of obese children and young adolescents with hypertensive parents should especially be measured frequently.

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