Hypertension in Thai Children: a Report from a Hospital in Suburban Area

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Hypertension in children is the major risk for cardiovascular disease in adult. Limited data are available for hypertension in children in Southeast Asia. To determine the cause, treatment, and long-term outcome of hypertension in Thai Children, the authors retrospectively studied 62 patients (age <15 years) diagnosed with hypertension at Thammasat University hospital, from December 01, 2004 through November 30, 2009. The mean age was 9.2 ± 4.2 years; median follow-up 8 months. Fifty five (88.7%) patients had secondary hypertension. Patients presented with stage 2 hypertension (67.7%), and hypertensive emergency (9.7%). Renal parenchymal disease caused 67.3% of secondary hypertension. End organ damage included left ventricular hypertrophy (11.3%) and hypertensive retinopathy (6.4%). Hypertensive emergency was caused mostly by acute poststreptococcal glmoerulnephritis (APSGN, 66.7%). Intravenous diuretic coupled with oral antihypertensive drugs gave uncontrolled blood pressure in APSGN with hypertensive emergency. Seventy percents of patients with essential hypertension had obesity. Majority of the patients had controlled hypertension without medication. Acute poststreptococcal glomerulonephritis remained the common cause of transient hypertension and hypertensive emergency in Thai children. The high incidence of obesity among essential hypertension in children demonstrated in the present study should alert Thai pediatrician to measure blood pressure in every obese child. Treatment of childhood hypertension was associated with good long-term outcome.

Keywords: *Hypertension, Children, Obesity, Essential hypertension, Primary hypertension, Left ventricular hypertrophy, Hypertensive retinopathy, Hypertensive emergency, Acute poststreptococcal glomerulonephritis, Thai.*

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Hypertension is one of the most common global health problems. It is a major risk for atherosclerosis leading to the cardiovascular disease in adult. Children with hypertension is also at risk to develop atherosclerosis in adolescent[1]. The prevalence of hypertension in children and adolescent is approximately 1-4 % in the last decade[2-4].

Many studies have reported an increasing prevalence of hypertension in adolescent largely attributable to the increase in prevalence of obesity[5-8]. The etiologies of hypertension in children are different among age groups. The secondary hypertension is more severe and likely to be an etiology in younger child, whereas the essential or primary hypertension is less severe and more likely to be an etiology in older child and adolescent. Renal parenchymal and renovascular diseases are the most common etiologies of hypertension in every age group in children[9]. Acute glomerulonephritis and hemolytic uremic syndrome are the most common causes of renal parenchymal diseases reported in Western countries. The causes of hypertension may vary due to demographic area, race, and ethnicity. Report of childhood hypertension in South East Asian have limited study on chronic hypertension from a tertiary hospital in Thailand[10]. Therefore, the aims of the present study were to evaluate the causes, complications, and long-term outcomes of hypertension in Thai children from a hospital in suburban area of Patumthani province, Thailand.

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Material and Method

Patients

Medical records of pediatric patients (0-15 years) diagnosed as hypertension at the Thammasat

University Hospital from December 01, 2004 through November 30, 2009 were retrospectively reviewed. This study was approved by the ethic committee of the Faculty of Medicine, Thammasat University.

Classification of hypertension in infants

The full-term neonates and infants blood pressure (BP) was measured by using oscillometric device. The diagnosis of hypertension was verified by application of BP standards generated by the Second Task Force[11]. The infants were included if the recorded BP exceeded the 95th percentile for at least 3 consecutive days.

Classification of hypertension in children and adolescents

The BP in all patients was measured with a standard clinical sphygmomanometer with appropriately sized cuff using a stethoscope, after resting 5 minutes. The height percentile of all patients was determined according to the standard height charts introduced by Centers for Disease Control and Prevention, national Center for Health Statistic, United State of America[12]. The patients older than 1 year were diagnosed as hypertension based on the reference BP values specific to gender, age, and height introduced by the National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescent in 2004[13].

Normal BP was defined as systolic and diastolic BP lower than the 90th percentile for age, gender, and height.

Prehypertension was defined as systolic and/or diastolic BP equal or greater than the 90th percentile but less than the 95th percentile.

Stage 1 hypertension was defined as systolic and/or diastolic BP that range from the 95th percentile to 5 mm Hg above the 99th percentile.

Stage 2 hypertension was defined as systolic and/or diastolic BP that was higher than 5 mmHg above the 99th percentile.

Hypertensive emergency was defined as the hypertension accompanied by signs and symptoms of end organ damages including hypertensive encephalopathy, pulmonary edema, and heart failure[14].

Obesity was defined as weight for height greater than the 120th percentile for age and gender for Thai children[15].

Transient hypertension was defined as duration of hypertension was less than 1 month.

Chronic hypertension was defined as duration of hypertension was longer than 1 month.

The patients were included in this study if the recorded BP exceeded the 95th percentile for at least 3 occasions.

Statistical analyses: Data are expressed as mean $\pm$ standard deviation (SD) or median (range).

Results

Sixty-two patients, 38 male (61.3%) with mean ($\pm$SD) age at diagnosis of 9.2 $\pm$ 4.2 years (range, 0.8 - 15 years), were enrolled. Twenty one (33.9%) patients were obese. Median period of follow up was 8 months (range, 0.25 - 60 months). Patient characteristics are shown in Table 1.

Causes of Hypertension

Among 62 children with hypertension, the majority of them were older than 6 years (n = 49, 79%). Forty-two patients (67.7%) presented with stage 2 hypertension (Table 1). Only 6 (9.7%) patients presented at onset with hypertensive emergency including hypertensive encephalopathy (n = 4), and pulmonary edema (n = 3). Essential hypertension and secondary

Table 1. Patient characteristic

Characteristic	Patients (Total = 62) n (%)
Age (yr, mean $\pm$ SD)	9.3 $\pm$ 4.2
Gender	
Male	38 (61.3)
Female	24 (38.7)
Body Stature	
Normal	37 (59.7)
Obesity	21 (33.8)
Protein Energy Malnutrition	4 (6.5)
Severity of HT at onset	
Prehypertension	2 (3.2)
Stage 1 HT	12 (19.4)
Stage 2 HT	42 (67.7)
Hypertensive emergency	6 (9.7)
Type of HT	
Essential HT	7 (11.3%)
Secondary HT	55 (88.7%)
Duration of HT	
Transient HT	32 (51.6)
Chronic HT	25 (40.3)
Unknown*	5 (8.1)

HT, Hypertension.

* Unknown duration of HT due to dead, and referred to other hospitals.

hypertension were identified in 7 (11.3 %) and 55 (88.7%) patients, respectively. The renal parenchymal disease was a predominate cause of secondary hypertension in the present. Acute poststreptococcal glomerulonephritis (APSGN) and lupus nephritis were the most common causes of hypertension in children age group of 6-12 years and 12-15 years, respectively (Table 2). Drug induced hypertension was the most common cause of HT in a group of 1-6 years. Steroid was responsible for hypertension in 5 patients. One patient developed hypertension after receiving cyclosporine and steroid. Central nervous system diseases and cardiovascular system diseases caused HT in 9 (14.5%) and 3 (4.8%), respectively (Table 2). The patients mostly presented with signs and symptoms of secondary causes of hypertension (n = 53, 85.5%). A total of 24 patients were diagnosed with APSGN. The majority of them presented with hypertension stage 2. Their BP was controlled by intravenous loop diuretic and mostly multiple oral antihypertensive drugs (Table 3).

Table 2. Causes of hypertension in children

Age group	Causes	Patients (Total = 62) n (%)
Newborn-1 year	Total	3 (4.8)
	Renal scar	1 (1.6)
	Tuberculous meningitis	1 (1.6)
	Pericarditis	1 (1.6)
1-6 years	Total	10 (16.1)
	Drug-induced hypertension	3 (4.8)
	Brain abscess	1 (1.6)
	Viral encephalitis	1 (1.6)
	Essential hypertension	1 (1.6)
	Nephrotic syndrome	1 (1.6)
	Wilm's tumorGuillain	1 (1.6)
	Barre syndrome	1 (1.6)
	Cerebrovascular disease	1 (1.6)
6-12 years	Total	26 (41.9)
	APSGN	18 (29.0)
	Essential hypertension	3 (4.8)
	Drug-induced hypertension	2 (3.3)
	Chronic renal failure	1 (1.6)
	Viral encephalitis	1 (1.6)
	Dilated cardiomyopathy	1 (1.6)
12-15 years	Total	23 (37.0)
	Lupus nephritis	8 (12.9)
	APSGN	6 (9.7)
	Essential hypertension	3 (4.8)
	Chronic renal failure	2 (3.2)
	Pineal gland tumor	2 (3.2)
	Dilated aorta with Ehler Danlos type IV	1 (1.6)
	Viral meningitis	1 (1.6)

APSGN, acute poststreptococcal glomerulonephritis.

Duration of Hypertension

Transient hypertension (n = 32, 51.6%) was more common than chronic hypertension (n = 25, 40.3%, Table 4). APSGN was the predominate cause of transient hypertension. The mean duration of hypertension in APSGN was 15.6 days (range, 3-30 days). The second most common cause of transient hypertension was CNS infection with a mean duration of 10.7 days (range, 5-21 days) of hypertension. Intravenous pulse methylprednisolone caused transient hypertension in 3 patients whose BP turned to be normal within 1 week. One patient with Guillain-Barre′ syndrome had transient stage 2 hypertension resolved within 1 week. Chronic hypertension frequently occurred in children older than 12-year-old (Table 3). Lupus nephritis (n = 8) and essential hypertension (n = 5) were the two most common causes of chronic hypertension. Chronic usage of cyclosporine coupled with oral steroid caused

Table 3. Characteristic of Hypertension in Acute Poststreptococcal glomerulonephritis

Characteristic	Patients (Total = 24) n (%)
Age (yr, mean ± SD)	9.9 ± 2.7
Severity of HT at onset	
Stage 1 HT	3 (12.5)
Stage 2 HT	17 (70.8)
Hypertensive emergency	4 (16.7)
Hypertensive encephalopathy	1 (4.1)
Pulmonary edema	2 (8.2)
Hypertensive encephalopathy and pulmonary edema	1 (4.1)
Treatment of HT	
Intravenous loop diuretic	24 (100)
Intravenous short acting antihypertensive drugs	4 (16.7)
Hemodialysis and oral anti hypertensive drug	1 (4.1)
Multiple oral antihypertensive drugs	21 (87.5)
Duration of HT (day, mean ± SD)	15.6 ± 7.6

HT, Hypertension.

Table 4. Duration of hypertension

Causes of HT	Transient HT (Total = 32) n (%)	Chronic HT (Total = 25) n (%)
Newborn-1 year: Total	2 (6.2)	1 (4)
Tuberculous meningitis	1 (3.1)	-
Pericarditis	1 (3.1)	-
Renal scar	-	1 (4)
1-6 years: Total	4 (12.5)	4 (16)
Drug-induced HT	2 (6.3)	1 (4)
Guillain Barre syndrome	1 (3.1)	-
Viral encephalitis	1 (3.1)	-
Essential HT	-	1 (4)
Nephrotic syndrome	-	1 (4)
Wilm's tumor	-	1 (4)
6-12 years: Total	9 (59.4)	5 (20)
APSGN	17 (53.1)	-
Viral encephalitis	1 (3.1)	-
Drug-induced HT	1 (3.1)	1 (4)
Essential HT	-	2 (8)
Chronic renal failure	-	1 (4)
Dilated cardiomyopathy	-	1 (4)
12-15 years: Total	7 (21.9)	15 (60)
APSGN	6 (21.9)	-
Viral meningitis	1 (3.1)	-
Essential HT	-	3 (12)
Lupus nephritis	-	8 (32)
Dilated aorta with Ehler Danlos type IV	-	1 (4)
Chronic renal failure	-	1 (4)
Pineal gland tumor	-	2 (8)

chronic hypertension in 2 children.

Hypertensive Emergency

Six patients (9.7%) presented with hypertensive emergency. They had secondary hypertension due to APSGN (n = 4), chronic renal failure (n = 1), and lupus nephritis (n = 1). Their presentations were generalized tonic clonic seizure, headache, vomiting, dyspnea, tachypnea and fatique. End organ damages were hypertensive encephalopathy (n = 3), pulmonary edema (n = 2), and both organs (n = 1). Three patients had hypertensive retinopathy stage 2-4. Left ventricular hypertrophy was detected in 4 patients. In 3 patients, BP was initially controlled with intravenous nicardipine. Their BP gradually decreased to 95th percentile within 48-72 hours without any complication. Four patients with hypertensive emergency secondary to APSGN initially received intravenous furosemide in combination with oral antihypertensive drug or intravenous hydralazine. Their BP levels in the first 3 days were demonstrated in Fig. 1.

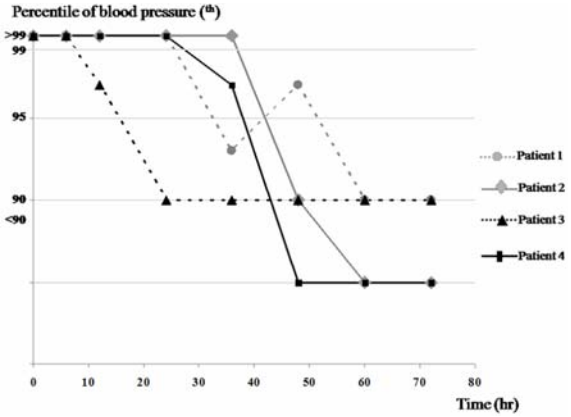

Fig. 1 Blood pressure levels during the first 3 days of admission of the 4 patients presented with hypertensive emergency secondary to acute poststreptococcal glomerulonephritis. Initial antihypertensive therapy; intravenous furosemide and oral hydralazine and then intravenous nicardipine at 16th hour (patient 1), intravenous furosemide and oral hydralazine (patient 2), intravenous furosemide and oral nifedipine (patient 3, 4).

Treatment of secondary hypertension and long-term outcome

Of 55 (88.7%) patients diagnosed with secondary hypertension, 47 patients had controlled BP. Hypertension was uncontrolled in 6 patients. Of these, 4 patients expired from primary diseases and 2 patients with poor drug compliance diagnosed with dilated cardiomyopathy (n = 1) and lupus nephritis (n = 1). At the onset of hypertension, left ventricular hypertrophy (LVH) was detected by echocardiography in 7 patients. Hypertensive retinopathy was detected in 4 patients. It was accompanied with LVH in 3 patients. Forty-seven (92.1%) patients were re-evaluated for hypertension with median duration of 7 months after diagnosed of secondary hypertension (Table 5). Of these, 34 patients had normal BP without antihypertensive drugs. Echocardiography of 3 patients demonstrated persistent LVH after 3 months of antihypertensive drugs. Persistent retinopathy identified in 2 patients after 3 months of antihypertensive drugs.

Essential hypertension

Of 7 patients with essential hypertension, five

Table 5. Treatment outcome of hypertension

Outcomes	Patients with essential HT (Total = 7) n (%)	Patients with secondary HT (Total = 55) n (%)
Outcome of treatment at onset of HT:		
Controlled HT*	6 (85.7)	47 (85.7)
Uncontrolled HT	1 (14.3)	6 (10.7)
NA**	-	2 (3.6)
End organ damage at onset of HT:		
LVH	1 (14.3)	6 (10.7)
Hypertensive retinopathy	1 (14.3)	3 (5.3)
Median duration of follow-up (months, range)	27 (6-56)	7.5 (0.25-60)
Total patients	7 (100)	46 (100)
Long-term outcome of treatment:		
Controlled HT without medication	3 (42.8)	34 (74.0)
Controlled HT with medication	4 (57.2)	10 (21.7)
Uncontrolled HT with medication	-	2 (4.3)
End organ damage at last evaluation:		
LVH	1 (14.3)	3 (6.5)
Hypertensive retinopathy	1 (14.3)	2 (4.3)

LVH, Left ventricular hypertrophy.
* Controlled HT defined as[14]
1. Blood pressure less than 95th percentile with persistent of secondary causes of HT.
2. Blood pressure less than 90th percentile with cure of secondary causes of HT.
3. Blood pressure less than 90th percentile in patient diagnosed with chronic renal failure, diabetes mellitus, or target organ damage.
4. Blood pressure less than 95th percentile in patient diagnosed with essential HT with out target organ damage.
** Data not applicable.

(71.4%) and 3 (42.8%) patients had obesity and family history of hypertension, respectively (Table 5). Four (57.1%) patients had stage 2 hypertension including 2 obese patients with obstructive sleep apnea. Dyslipidemias were identified in 3 patients. None of them had abnormal fasting blood sugar. End organ damages were left ventricular hypertrophy (n = 1), and hypertensive retinopathy stage 1 (n = 1). Most of the patients initially received a single antihypertensive drug. Only one obese patient had normal blood pressure after therapeutic life style modification without antihypertensive drug. The follow-up rate was 100% with a median of 27 months (range, 6-56 months). At last visit, four (57.1%) patients had normal BP without antihypertensive drugs (Table 6). Left ventricular hypertrophy and hypertensive retinopathy persisted in 2 patients after 12 and 24 months of antihypertensive drugs, respectively.

Discussion

This is the study to evaluate causes of hypertension in children and outcome of treatment from a hospital in suburban area, Southeast Asia. In this cohort of patients, renal parenchymal diseases were the most common causes of transient and chronic hypertension in children. In the present study, the 60% incidence of renal parenchymal diseases causing hypertension is was comparable to the previous studies[10,16,17]. Similarly, chronic glomerulonephritis and chronic renal failure were the leading causes of persistent hypertension among our patients. Hypertension associated with congenital renal anomalies were not identified in this study, similar to previous study in Thai children[10]. The present study recruited children with both transient and chronic hypertension. Therefore, there was a high incidence of APSGN and hypertension secondary to central nervous system diseases. APSGN remains common in developing country. It was the most common cause of hypertensive emergency in this study. There was no controlled study of treatment of hypertensive emergency in children. In general, the goal of

Table 6. Characteristic of Essential hypertension

Characteristic	Patients (Total = 7) n (%)
Age (yr, mean ± SD)	10.8 ± 3.0
Body stature	
Normal	2 (28.6)
Obesity	5 (71.4)
Severity of HT at onset	
Stage 1 HT	3 (48.2)
Stage 2 HT	4 (57.2)
Hypertensive emergency	-
Family history of HT	
Target organ damage	
Hypertensive retinopathy	3 (48.2)
Left ventricular hypertertrophy	1 (14.3)
Co-morbidity	
Dyslipidemias	1 (14.3)
Treatment of HT	
Therapeutic life style changes only*	3 (42.8)
Antihypertensive drugs	1 (14.3)
Single oral drug	5 (71.4)
Multiple oral drugs	1 (14.3)
Out-come of treatment	
Controlled HT**	6 (85.7)
Uncontrolled HT	1 (14.3)

HT, Hypertension. *Therapeutic life style changes include weight reduction, regular aerobic exercise, and dietary modification [13]. **In essential HT, controlled HT defined as blood pressure less than 95th percentile without target organ damage or blood pressure less than 90th percentile with target organ damage [14].

emergency therapy is to reduce the mean arterial pressure by 25% within the first 6-8 hours in order to prevent ischemic injury in individuals with structural hypertensive arterial changes[14,18,19]. Although acute rising of BP in children with acute glomerulonephritis may not induce structural changes in arterial vessels. However, gradually reduction of BP during the first 24 hr should be encouraged. The present study demonstrated that intravenous loop diuretic coupled with oral antihypertensive drug were not suitable for hypertensive emergency secondary to APSGN as BP reduction rate was uncontrolled. We experienced both sustained severe hypertension above 99th percentile and precipitous fall in blood pressure as demonstrated in Fig. 1. Thus, intravenous short acting antihypertensive drugs coupled with intravenous loop diuretic are preferred in this clinical setting in order to ameliorate salt and water retention and allow us to titrate antihypertensive drug to produce controlled reduction in blood pressure.

Hypertension is one of the most important risk factors for cardiovascular disease in adult. Childhood hypertension has been associated with increased left ventricular mass and increased carotid artery intimal-medial thinkness[20-22]. Several studies reported 34-41% incidence of left ventricular hypertrophy in childhood hypertension[20,22,23]. The 11.3% incidence of left ventricular hypertrophy in the present study was underestimated because echocardiography was not performed in every patient. Retinal arteriolar narrowing is a consequence of chronic hypertension and predicts cardiovascular mortality in adult[24]. Recent study in children demonstrated that high blood pressure associated with retinal arteriolar narrowing[25]. The National High Blood Pressure Education Program (NHBPEP) report recommends a retinal exam in hypertensive children[13]. Only 32.3% of patients in the present study had retinal examination by ophthalmologist. However, our 6.4% incidence of hypertensive retinopathy was comparable to 8.6% reported in the literature[26].

In the present study, most patients had long-term re-evaluation of hypertension. The majority of them had controlled blood pressure and independent from medication. Few patients with on-going treatment of underlying diseases depended on antihypertensive drugs. The authors experienced persistent LVH at 1 and 2 years after controlled BP in two patients. No study in children demonstrated regression of LVH after good control of hypertension. Two patients in this study had persistent hypertensive retinopathy after 3 months and 1 year of antihypertensive drugs. The report on resolution of hypertensive retinopathy after resolution of hypertension was limited in newborns[27].

The authors reported unusual causes of hypertension in children. Transient stage 2 hypertension accompanied with viral pericarditis was identified in a 10 month-old boy. His BP was under controlled with 2 weeks of enalapril and remained normal at 2 year of follow-up. The mechanism of hypertension in pericarditis remains unknown. We speculate that inflammation of viral infection causing pericarditis may aggravate the high blood pressure due to inflammatory mediators. Dilated left ventricle with poor left ventricular function and coexisting systemic hypertension has been reported[28]. Normalization of left ventricular dimensions and function occurred after adequate treatment in patients. In the present study,

one patient with spastic cerebral palsy, and mental retardation had normal BP until he developed congestive heart failure from viral myocarditis and turned out to be dilated cardiomyopathy during the follow-up. Interestingly, he developed hypertension since the episode of his congestive heart failure but his poor left ventricular function still persisted. The mechanism for his hypertension remained unclear. One patient with Ehler-Danlos syndrome had dilated aorta and arthritis treated with steroids developed hypertension and required antihypertensive drugs. A review of the Ehlers-Danlos syndrome patients demonstrated hypertension in 4 of 200 patients. Three of these patients, and probably all four, had secondary causes of hypertension: Cushing's syndrome, renal insufficiency, or renovascular hypertension[29]. In the present study, this patient died 2 months after the onset of hypertension with unidentified cause.

A strong association of high BP with childhood obesity is well known[8]. In this century, the prevalence of childhood obesity is increasing in Western countries[30-32]. Similarly, Thailand is facing this problem as demonstrated by data from three consecutive National Health examination surveys[33]. Obesity prevalence in Thai children has increased from 5.8% in 1997 to 7.9% in 2001 for the 2-5-year-olds and from 5.8% to 6.7% for the 6-12-year-olds[33]. Our 71% incidence of obesity in patients with essential hypertension was higher than the 53% reported from a tertiary hospital in 2006[34]. We suspected that the difference was due to an increasing prevalence of obesity in Thai children. Sleep abnormalities are prevalent among obese children and contribute to hypertension[35]. We identified a patient as young as 4 year-old having stage 2 hypertension with obstructive sleep apnea and morbid obese. This finding indicates that blood pressure should be evaluated in all obese children regardless of age and especially in children with sleep abnormalities. The present study should alert Thai pediatricians for essential hypertension and obesity along with an increasing prevalence of obesity in Thailand.

The limitations of the present study should be noted. The incidence of hypertension and end organ damages in this study may be lower than it should be by the nature of a retrospective study. In order to early identify children with hypertension, pediatricians should aware of the children at risk to develop this serious condition. As recommended by the National High Blood Pressure Education Program (NHBPEP) working group on children and adolescent in the United State of America, children over the age of 3 years seen in medical care and under age 3 years with special circumstances should have their blood pressure measured[13]. In the present study, the authors employed the blood pressure normograms introduced by the NHBPEP[13] coupled with the standard height charts based on data from children in the United State[12]. These references may not be suitable for Thai children. Since the blood pressure percentile values may change as the group demographics, race, ethnicity, and characteristics of population. A recent study from Pakistan, South Asia, demonstrated that body mass index of their children was lower than those of the children in the United State reported by the Third National Health and Nutrition Examination Survey (NHANES III)[36]. By plotting age- and height-percentile-specific systolic and diastolic blood pressure values of Pakistan children on normograms derived from the US population, they demonstrated a higher prevalence of childhood hypertension compared with those of the Americans. To date, no standard blood pressure reference for Southeast Asian children is available. Therefore, it is an urgent need of a study of population based blood pressure in Thai Children and adolescent. Such a study would provide valuable reference to evaluate childhood hypertension in Thailand.

Conclusion

In conclusion, the present study reported the causes, complications, treatment, and long-term outcomes of hypertension in Thai children from a hospital in suburban area of Patumthani provice, Thailand. The present study demonstrated unpredictable blood pressure controlled by intravenous loop diuretic coupled with oral antihypertensive drugs for the treatment of hypertensive emergency secondary to APSGN in children. Therefore, the combination of intravenous short acting antihypertensive drug and intravenous loop diuretic should be considered as the first line drug for hypertensive emergency caused by APSGN. The high incidence of obesity accompanied with essential hypertension and a rapid increasing prevalence of obesity should alert all pediatricians to carefully screen the essential hypertension in every single obese child.

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ความดันโลหิตสูงในเด็กไทย

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ความดันโลหิตสูงในเด็กเป็นปัจจัยเสี่ยงสำคัญต่อการเกิดโรคหัวใจและหลอดเลือดในผู้ใหญ่ การศึกษาเกี่ยวกับความดันโลหิตสูงในเด็กในภูมิภาคเอเชียตะวันออกเฉียงใต้มีจำกัด ผู้นิพนธ์ทำการศึกษาย้อนหลังสาเหตุของความดันโลหิตสูง ภาวะแทรกซ้อน การรักษาและผลการรักษาระยะยาวในผู้ป่วยเด็กอายุน้อยกว่า 15 ปี ที่รับการรักษาที่โรงพยาบาลธรรมศาสตร์เฉลิมพระเกียรติระหว่างวันที่ 1 ธันวาคม พ.ศ. 2548 – 30 พฤศจิกายน พ.ศ. 2552

ผู้ป่วย 62 ราย อายุเฉลี่ย 9.2 ± 4.2 ปี มาติดตามการรักษาเฉลี่ยนาน 8 เดือน ผู้ป่วย 55 ราย หรือ ร้อยละ 88.7 มีความดันโลหิตสูงชนิดทุติยภูมิ สาเหตุที่พบบ่อยที่สุดคือ renal parenchymal disease ร้อยละ 67.3 แรกวินิจฉัย ผู้ป่วยส่วนใหญ่มีความดันโลหิตสูงชนิดรุนแรง (hypertension stage 2) ร้อยละ 67.7 พบความดันโลหิตสูงชนิดต้องการรักษาอย่างเร่งด่วน (hypertensive emergency) ร้อยละ 6.4 ซึ่งส่วนใหญ่มีสาเหตุจาก acute post-streptococcal glomerulonephritis (APSGN) การรักษาผู้ป่วย APSGN ที่มีภาวะ hypertensive emergency ด้วยยาขับปัสสาวะชนิดฉีด ร่วมกับยาลดความดันโลหิตชนิดกินไม่สามารถควบคุมความดันโลหิตในระยะ 72 ชั่วโมงแรกได้ตามเป้าหมาย ภาวะแทรกซ้อนจากความดันโลหิตสูงได้แก่ left ventricular hypertrophy ร้อยละ 11.3 และ hypertensive retinopathy ร้อยละ 6.4 ในผู้ป่วยความดันโลหิตสูงชนิดปฐมภูมิพบภาวะอ้วนร้อยละ 71.4 การติดตามผู้ป่วยในระยะยาวพบว่าผู้ป่วยส่วนใหญ่มีความดันโลหิตปกติโดยไม่จำเป็นต้องใช้ยา

APSGN เป็นสาเหตุหลักของภาวะความดันโลหิตสูงชนิดต้องการรักษาอย่างเร่งด่วนในเด็กไทยผู้ป่วยความดันโลหิตสูงชนิดปฐมภูมิมักเกิดจากภาวะอ้วน ดังนั้นกุมารแพทย์ควรทำการวัดความดันโลหิตในเด็กอ้วนทุกรายเพื่อให้การวินิจฉัยและรักษาภาวะความดันโลหิตสูงที่อาจพบร่วมอย่างทันท่วงที