

Childhood Hypertension and Prehypertension: An Underappreciated Epidemic

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Abstract

Hypertension and Prehypertension are a common condition of children associated with high mortality and morbidity. It has its origin in early childhood and goes undetected unless and until specially looked for during this period. Globalization and urbanisation has brought more changes in the lifestyle of adolescent boys and girls, who are exposed to multiple risk factors like increase in weight gain, habit of eating junk foods, school and carrier stress, less physical work, less outdoor games and hereditary risk factors. Early detection and diagnosis of hypertension and prehypertension is an important strategy in its control, treatment and prevention of complications in children. Hypertension and prehypertension are one of the major killer diseases in the world. For early detection of hypertension, accurate blood pressure measurements should be a routine part of annual physical examination of all children after three years of age.

Keywords: Childhood hypertension; Prehypertension; Lifestyle modification.

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Introduction

Hypertension and Prehypertension are one of the commonest diseases with worldwide prevalence of 1 billion. Third National Health and Nutritional Assessment Survey reveals that in United States America, one-third of people were unknown of hypertension.¹ The seventh Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure report mentions that each increment of 20 mmHg systolic or 10 mm Hg diastolic blood pressuredoubles the chances of cardiovascular disease.² Data of hypertension and prehypertension are not available in children. In children age, sex and

height should be taken into consideration while interpreting blood pressure readings. Essential hypertension is associated with family history of hypertension, overweight, short stature, kidney diseases and raised levels of uric acid. Effective and early treatment of hypertension decreases the risk of cardiovascular disease, stroke, and renal disease etc.³

Prevalence of Primary and Secondary Hypertension: The prevalence of hypertension and prehypertension varies in children with different age groups. Around 5% of the general population is hypertensive. In 10 to 19-years school children, the prevalence of hypertension is 4.5%. In short, hypertension is one of the most common preventable condition facing to Paediatricians. The risk factors associated with hypertension are gender (males), ethnicity and increased BMI. The prevalence of hypertension in obese and overweight children is as high as 11%.⁴

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Measurement of blood pressure:

- Blood pressure recording should be done on standard mercury sphygmomanometer.⁵
- Mercury blood pressure measurement instrument remains the method of choice.
- Automated oscillometric devices are useful in evaluating of blood pressure of infants and small children who cannot stay quite but are expensive and require periodic calibrations.
- Blood pressure cuff should encircle 80-100% of arm and bladder length should be >40% of the arm circumference.⁶
- In appropriately small blood pressure cuffs give high readings and inappropriately large blood pressure cuffs will underestimate the true reading.
- Blood pressure reading should be taken after 3 to 5 minutes of resting.
- Blood pressure measurements in child should be taken while sitting with arm at the level of the heart or in supine position.
- Ambulatory blood pressure monitoring (ABPM)-blood pressure measurement is done through 24-hr approximation of true blood pressure than does a single measurement.

According to the Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents.⁶

- **Definition of Hypertension:** average systolic and/or diastolic pressure more than 95th percentile for age, sex and height on more than three occasions.
- **Definition of Prehypertension:** average systolic or diastolic pressures between 90-95th percentile for age, sex and height on more than three occasions.⁷
- In short, Adolescents with blood pressure levels more than 120/80 mm Hg should be considered prehypertensive child.
- **White-coat hypertension:** A child whose blood pressure levels are more than 95th percentile in a clinic but who is normotensive outside a clinical setting.
- **Stage 1 hypertension:** if blood pressure reading is in between 95th percentile to the 99th percentile plus 5 mm Hg, should be repeated on 2 more occasions.
- **Stage 2 hypertension:** blood pressure measurements more than 99th percentile plus 5 mm Hg.

Causes of Hypertension in Children:

- **Newborns:** Renal artery thrombosis or stenosis, coarctation of aorta and Broncho-pulmonary dysplasia, congenital malformation etc.
- **One -6 yr:** kidney diseases, coarctation of aorta, renal artery stenosis/thrombosis etc.
- **6-10 yr:** Essential hypertension, renal artery stenosis/thrombosis, renal disease etc.
- **Adolescence:** Essential hypertension and renal diseases.⁸

Criteria for diagnosis of Childhood hypertension⁹

Age	Normal	Prehypertension	Stage I Hypertension	Stage II Hypertension
3-11 years	<90 th percentile	90 th -<95 th percentile	95 th -99 th Percentile + 5mm Hg	>99 th percentile + 5 mm Hg
12-17 years	<90 th percentile	90 th -<95 th percentile or > 120/80 mm Hg	95 th -99 th percentile + 5 mm Hg	>99 th percentile + 5 mm Hg

Clinical Presentation

- Infants usually present with acute distress and features of congestive heart failure.
- In rest of the age groups mostly hypertension and prehypertension are asymptomatic.
- **Severe hypertension:** headache, vision changes, nosebleeds and nausea.
- **Rapidly progressive renal failure:** Edema, oliguria and hematuria.
- **Connective tissue disorders:** Joint pains, rash and systemic symptoms.
- **Hypertensive emergencies:** seizures, stroke, focal deficits, acute heart failure, pulmonary edema, dissecting aortic aneurysm or acute renal failure.
- **longstanding hypertension:** Cardiomegaly, hypertensive retinopathy or neurological involvement.¹⁰

Evaluation of Child with Hypertension:

Depends on-

- Age of Child and age of presentation.
- Severity of the Prehypertension or hypertension.
- Extent of end-organ damage.
- Long-term risk factors for the child.

Children with blood pressure measurements more than 90th percentile have 2.4 times the risk of hypertension in adulthood, compared to those with measurements below 90th percentile.⁶

Level I

- Haemogram.
- Serum electrolytes estimation.
- Serum uric acid, renal function tests and lipid profile assessments.
- Urine examination and culture.
- Renal ultrasound.

Level II

- 2-D Echocardiography.
- Nuclear scans.
- Colour Doppler ultrasound of renal arteries.
- Estimation of Serum T3, T4 and TSH.
- Assay of Urinary catecholamine.
- Measurements of Plasma aldosterone and plasma rennin activity.
- MIBG scan.
- Renal arteriography.⁶

Objectives for treatment:

1. Maintenance of a diastolic blood pressure below 85th percentile for same sex, chronological age and body mass.
2. Control hypertension and prehypertension with non-pharmacological measures.
3. Use of single antihypertensive drugs with minimal side effects of drugs.
4. Child's compliance with treatment objectives.
5. Prevention of end-organ damage.
6. To promote normal growth and development of child.¹¹

Management of Childhood hypertension:

1. Non-pharmacologic measures:
 - ▲ Weight reduction,
 - ▲ Exercise
 - ▲ Dietary intervention.
 - ▲ Restrict daily sodium intake by 1.2g/day in 4-8-years child and 1.5g/day for above 8 year old children.⁵
2. Pharmacologic therapy:

Indications only in severe hypertension or where non-pharmacological intervention alone fails to control the blood pressure.¹¹

Drugs	Characteristics
Diuretics	Volume-overload, low plasma renin activity and congestive heart failure.
Angiotensin converting inhibitors/angiotensin receptor blockers	High plasma renin activity, unilateral renovascular hypertension, glomerular proteinuria, congestive heart failure, diabetesmellitus, gout, and hyperlipidemia
Calcium channel blockers	Emergency hypertension, black race, diabetes mellitus, bronchopulmonary dysplasia, gout, hyperlipidemia, and peripheral vascular disease.
Beta-adrenergic antagonists	Contracted intravascular volume, attention deficit disorder, hyperdynamic circulation, steroid intake, hyperthyroidism, and neuroadrenergic tumors.

Hypertensive Emergencies:

- Children with seizures, severe headaches, eye changes or cardiac failure, Blood pressure to be lowered in first one hour.
- Before establishment of access and delivery of other medications give Oral or sublingual nifedipine.
- Give Intravenous IV sodium nitroprusside or labetalol infusion if available.
- Give bolus of IV hydralazine, when an infusion is unavailable.¹²

Hypertensive urgencies:

- In this condition, the immediate risk of complications is less but prompt institution of drug therapy and reduction of blood pressure over 24 hr is appropriate.
- Mostly it occurs in child with acute glomerulonephritis, accelerated hypertension or after kidney transplantation.¹³

3. Surgery:

- It is indicated for Correction of renal artery stenosis and for pheochromocytoma.¹³

4. Length of Therapy:

- The exact duration of treatment of Hypertension and Prehypertension for an adolescent is unknown.
- Blood pressure should be monitored properly in order to avoid hypertension in the future.¹³

Prevention of Childhood hypertension:

- To create awareness among school children regarding hypertension and its complications.
- School management should organize hypertension screening programmes in the school.
- Parents should be educated about awareness of Adolescent hypertension.
- Children should be educated about good life style and healthy food habits.
- Parents and teachers should be sensitized on over nutrition and health hazards of obesity.
- Periodic surveys to be done in schools on adolescent hypertension and for tracking of blood pressure.
- Early detection and intervention is more important for hypertension and prehypertension.¹⁴

Conclusion

Childhood hypertension goes unrecognised which leads to hypertensive diseases in adult life. Its tracking is important for prevention of emerging of non communicable diseases. Major preventive measure being early diagnosis, modification of lifestyle etc.

References

1. The Sixth Report of Joint National Committee on Prevention Detection, Evaluation and Treatment of High Blood Pressure. Arch Intern Med 1997; 157: 2413-2446.
2. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report. JAMA 2003; 289: 2560-2572.
3. Collins R, Peto R, MacMahon SW, Hebert P, Fiebach NH, Eberlein KA et. al. Blood pressure, stroke and coronary heart disease, 2: short-term reductions in blood pressure: Overview of randomized drug trials in their epidemiologic context. Lancet 1990; 335: 827-838.
4. MG Seikaly, "Hypertension in children: an update on treatment strategies," Current Opinion in Pediatrics, 2007 vol. 19, no. 2, pp. 170-177.
5. National High Blood Pressure Education Program Working Group on Hypertension Control in Children and Adolescents. Update on the 1987 task force report on high blood pressure in children and adolescents: a working group report from the National High Blood Pressure Education Program. Pediatrics 1996;98: 649-658.
6. National High Blood Pressure Education Program Working Group on High Blood Pressure In Children and Adolescents. The fourth report on the diagnosis, evaluation and treatment of high blood pressure in children and adolescents. Pediatrics 2004; 114:555-576.
7. Must A, Jacques PF, Dallal GE, Bajema CJ, Dietz WH. Long-term mortality and morbidity of overweight adolescents: a follow-up of the Harvard Growth Study of 1922 to 1935. N Engl J Med 2000; 327: 1350-1355.
8. McTaggari SJ, Gulati S. Evaluation and long term outcome of pediatric renovascular hypertension. Pediatr Nephrol 2000; 14:1022-1029.
9. Rao G. Diagnosis, Epidemiology, and Management of Hypertension in Children. American Academy of Pediatrics. 2016;138(2).
10. Mahoney LT, Clarke WR, Burns TL, and Lauer RM. Childhood predictors of high blood pressure. Am J Hypertens 991;4:608.
11. Mouin G. Seikaly, Highlights for management of child with hypertension. International Journal of Pediatrics volume 2013;5.
12. Yiu V, Orrbine E et. al. The safety and use of short-acting nifedipine in hospitalized hypertensive children. Pediatr Nephrol 2004;19: 644-650.
13. Sanjeev gulati, Review article on childhood hypertension, Indian journal of paediatrics. volume 43, 2006, 328-332.
14. Jasmine S Sundar, Prevalence and Determinants of Hypertension among Urban School Children in the Age Group of 13-17 Years, India Sundar et. al., Epidemiol 2013, 3:3.

