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Hypertension in Children: Manifestation and Oral Treatment with Therapeutic Approach

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Abstract: ***Hypertension is community health problem particularly in industrial countries. Many treatments focused on primary prevention and hypertension control in adults. Nevertheless, increasing hypertension incident in young age group has attracted attention in severity and complication of disease in children and adolescents. Very high influence of community health on hypertension in children is because may of younger group will finally receive medical treatment when adults. Blood pressure reproducibility in children can suddenly increase, especially in adolescent, and practitioner should aware to read range of blood pressure measurement in children. Dental care provision for hypertension children require knowledge about etiology of blood pressure elevation, oral manifestation, damage of target organ, and drugs interactions. This paper provide opinion about hypertension in children and their oral health management.***

Keywords: hypertension, oral manifestation, normal blood pressure, pediatric patient, treatment

1. Introduction

Hypertension is defined by blood pressure reading exceeding threshold that differs individual at risk of hypertension and not potential of hypertension. Continuous effect in blood pressure increase harmful risk, such stroke and myocardia. Many researches focused on primary prevention and hypertension control in adulthood. However, increasing hypertension incident in young age group has attracted attention in disease severity and complication in children and adolescent. Effect of hypertension in children is very high because many individuals finally referred to medical treatment because that problem. Pediatric management and screening with high blood pressure have to be a part of curriculum of dental school because the increasing incident of this disease.[1]

Prevalence of hypertension in children is significantly lower (1-3%). Majority of these children only have slight elevation of blood pressure and included in primer hypertension category (essential). However, there are small groups of children with much higher blood pressure, most of them suffer secondary hypertension. Prevalence of persistent secondary hypertension in children is 0,1%, and renal diseases are dominant in this group, more than 80% will have underlying kidney disease.[2]

Several factors known related to hypertension in adults also related to higher blood pressure rate in children and adolescent. A direct association between body weight and blood pressure has been recorded for 5 years recently and this association is more prominent in last two decades. The height is associated with blood pressure in any ages. Gender and ethnic do not impact blood pressure in children likewise in adults. Many factors influence elevation of hypertension in children and adolescent starting from prenatal to natal phase. In practice, dentist should know general conditions include signs of hypertension. Therefore, dentist has already aware in treating patients with possibility of hypertension.[2]

2. Literature review

Hypertension has relative low prevalence in children than in adults. Nevertheless, for some children, the problems are in detection guideline, evaluation, and treatment planning which are very important in their treatment. In addition, generally adulthood hypertension will give effect at that time. However, healthy children now, should have performed prevention to avoid possibility of hypertension in children even before the effect shown.[1]

Prevalence and Risk of Hypertension in Children

The prevalence of hypertension in children was significantly lower (1-3%). Majority of these children have only mild increase in blood pressure and included in primary hypertension category (essential). Nevertheless, there is a small group of children with much higher blood pressure, mostly suffering from secondary hypertension. Prevalence of persistent secondary hypertension in children is about 0.1%, and the dominant kidney disease in this group, more than 80% will have underlying kidney disease.[2]

Although prospective cohort data on association between childhood blood pressure (BP) and cardiovascular risk isn't available now. However, there are strong reasons for developing basic information about BP in children and adolescents. First, prevalence of hypertension in the general US adult population has been estimated at 25%, or more than 50 million Americans. Despite the amount of clinical hypertension prevalence considerably lower among children than adults, many evidence supports the concept that severity of hypertension starts from childhood. Second, heredity for BP has been set from early infancy, and children who tend to have

higher blood pressure come from families with a history of hypertension. Third, although generally agreed that small risk of hypertension occur in children, evidence from earlier studies among children and adolescents has shown hemodynamic changes of heart ventricle and having direct association with side effects of mild hypertension before the third decade of life. Fourth, high BP is associated with insulin resistance syndrome (hyperinsulinemia, dyslipidemia, obesity) before adulthood. Despite BP was not significantly correlated with insulin resistance in children, it appears that significant relationship develops during adolescence. Adolescents with high BP have greater effect on insulin resistance when compared to those with lower BP. Thus, height of BP during the first two decades is the early warning sign of overall cardiovascular risk.[1]

Several factors known associated with hypertension in adulthood also related with higher BP level in children and adolescent. A direct association between body weight and BP has been recorded during last 5 years and this association is more prominent in last two decades. (ketinggiannya?) associated with blood pressure at any age. Gender and ethnic don't impact blood pressure in children likewise in adults. There is no significant difference found in comparison of white, black, Hispanic, and Southeast Asia. Although small differences and vary along epidemiology studies. Standard reference of BP in children not differ between ethnic groups, because differences clinically not relevant. BP in boys is slightly higher than girls during the first decade of life. The difference between men and women started evident at puberty, and BP appears markedly higher in men in their late adolescent years. Family history, children from families with hypertension tend to have higher BP than children from family with normal BP, and significant correlation of BP and cardiovascular risk factors between parents and their children has been obtained. Siblings with high BP have much higher BP than the siblings of children with lower BP. Higher BP correlation between mothers and their children than between fathers and their children, indicating a direct relationship before birth.[1]

Other factors can trigger hypertension include:[3]

1) Changes in steroid metabolism
   Some studies suggest an association between steroid metabolism and hypertension. In these study, found that steroid consumption during pregnancy can cause changes in fetus digestive function. This causes protein cannot be digested properly so that fetus is born will have low weight. It became originator of hypertension in children as adults.[3]
2) Transport changes in kidneys
   Mannin et al. conclude that changes in kidneys will cause improper sodium retention. This sodium transport will cause damage in mRNA of BSC1 and TSC kidney and increase hypertension.[3]
3) Endocrine changes
   Vicker et al. suggested an association of malnutrition during pregnancy, followed by administration of excessive nutrition after birth. This leads to increased obesity, hypertension, and insulin deficiency.[3]
4) Growth factors and inflammation
   An important growth factor in the formation of kidney. Changes to these growth factors cause deformation in kidneys and lead to deficiencies of protein absorption in kidneys.[3]

There are various techniques in measuring and evaluating BP in children. Auscultation measurement method is not suitable in infants and toddlers because of anxiety issues and cooperatives. Therefore, digital measuring devices most widely used in that children group, and these tools can be used generally. BP measurements suggested in beginning of the third year.1

Determining hypertension among children and adolescents based on clinical experience and data collection than patients risk data. The category divided into BP percentile as follows: 1

1) Normal BP: SBP dan DBP <90% age and gender.
2) Early hypertension: average SBP and DBP or both between 90-95% of age and gender.
3) Hypertension stage 1: averange SBP and DBP ≥ 95% < 99% + 5 mmHg of age and gender.
4) Hypertension stage 2: averange SBP or DBP ≥ 99% +5 mmHg of age and gender.

Table 1: BP measurement based on age and gender [1]

	Systolic BP centiles							
	Boys				Girls			
Age (yr)	50th	90th	95th	99th	50th	90th	95th	99th
1	85	99	103	110	86	100	104	111
4	93	107	111	118	91	104	108	115
8	99	112	116	123	98	111	115	122
12	106	120	123	131	105	119	123	120
17	129	132	136	138	111	125	129	126
	Diastolic BP centiles							
Yr	50th	90th	95th	99th	50th	90th	95th	99th
1	37	52	57	64	40	54	58	65
4	50	65	69	77	52	67	71	78
8	59	73	78	86	58	72	76	83
12	62	76	81	89	62	76	80	88
17	67	82	87	94	66	80	84	91

Table 2: Normal BP measurement in children and adolescent based on age and gender.[4]

Age (Yr)	Boys (mm Hg)	Girls (mm Hg)
1	85/37	86/40
2	88/42	88/45
3	91/46	89/49
4	93/50	91/52
5	95/53	93/54
6	96/55	94/56
7	97/57	96/57
8	99/59	98/58
9	100/60	100/59
10	102/61	102/60
11	104/61	103/61
12	106/62	105/62
13	108/62	107/63
14	111/63	109/64
15	113/64	110/65
16	116/65	111/66
17	118/67	111/66

Assessment level of secondary hypertension in children and adults can be assessed according to the following provisions: [5]

1) Stage I: early hypertension, systolic BP 130-149 mmHg and diastolic BP 90-99 mmHg.
2) Stage II: moderate hypertension, systolic BP 150-169 mmHg and diastolic BP 100-109 mmHg.
3) Stage III: high hypertension, systolic BP 170-189 mmHg and diastolic BP 110-119 mmHg.
4) Stage IV: very high hypertension, systolic BP more than 190 mmHg and diastolic BP lebih dari 120 mmHg.

Table 3: Clinical appearance of hypertension in children and adolescent.[6]

	Clinical apperances
Vital signs	Tachycardia, decreasing femoral pulse rate, femoral pulse rate < brachialis pulse rate
Height and body weight	Slow growth, obesity, abdominal obesity
Head and neck	Moon face, Elfin face, Webbed neck
Skin	Pale, red, acnes
Thorax	Broad papilla, abnormal heart sound, Friction rub

Clinical examination should begin by assessing growth parameters, especially height and weight, and BP examination on both arms and on one leg. After that, examination should be focused on finding other signs of hypertension such as decreased femoral pulse.[6] (Table 2)

Non-pharmacologic management of hypertension

Dieting is the safest way to manage patients with hypertension. The best diet for hypertension centered on sodium. In salt-sensitive hypertension, reducing sodium consumption can give good results. Reduction of sodium consumption and increase consumption of potassium and calcium can provide antihypertensive effect.[6]

Pharmacologic Management of Hypertension

Drugs use in children should be done with caution. Indications right before pharmacological treatment should be obtained before treatment performed. Acceptable indications for use of antihypertensive medications in children and adolescents according to National High Blood Pressure Education Program Working Group) include: symptomatic hypertension, secondary hypertension, hypertension which damages organ, diabetes (type 1 and 2), hypertension which can't be cured using non-pharmacological treatment.[6]

Antihypertensive drugs which can be administered in pediatric patients and adolescents include: Captopril, Chlorothiazide, Diazoxide, Furosemide, Hydralazine, Hydrochlorothiazide, Methyldopa, Minoxidil, Propranolol, Spironolactone, Amlodipine, Benazepil, Enalapril, Eplerenone, Fenoldopam, Fosinopril, Irbesartan, Losartan , Lisinopril, Metoprolol, Valsartan, Aliskiren, Candesartan, Olmesartan, Ramipril, Sodium nitroprusside, Telmosartan.[6]

Oral manifestation and treatment of hypertension

Most of oral manifestations of hypertension is the result of side effects of antihypertensive drug therapy or severe illness. Dry mouth and pain is often caused by lack of fluid, adrenergic inhibitors, and ACE inhibitors. Lichenoid drug effects occurred in less than 20% of patients taking furosemide, labetalol. methyldopa, propranolol, and thiazides. These effects often appear as mucosal erosion or red-white macula located on tongue, buccal mucosa and lips. Face rash like lupus is rare side effect of hydralazine, while nifedipine, verapamil and diltiazem cause gingival hyperplasia. Excessive bleeding after oral surgery is a frequent complication of severe hypertension.[7]

Before starting dental treatment in patients with hypertension, someone must assess the severity of condition. Initial assessment should begin by informing patients about abnormal blood pressure, then find out if patient is currently taking antihypertensive medication, when the last time patient evaluated by physician, wheter patient's blood pressure is well controlled, and whether the patient has complications of hypertension such myocardial infarction, kidney disease, transient ischemic attack, or stroke.[7,8]

Blood pressure recording function as screening tool, a basis for evidence in the future, and as a diagnostic aid in determining classification risk of patients according to the American Society of Anesthesia (ASA). Hypertension is detected by checking blood pressure after patient has been sitting for at least 10 minutes. This will reduce the possibility of obtaining high blood pressure caused by physical activity or undue anxiety. Cuff size should be chosen carefully, because too small cuff raised blood pressure and too big cuff reduces the recorded blood pressure.[7]

Readings indicate high blood pressure do not make diagnosis of hypertension, and blood pressure can vary up to 10 mmHg between right and left arm. Therefore, all records must be confirmed by repeating the measurement on the same arm (usually right) with the patient lying down.[7]

Patients with blood pressure above 140/90 mmHg in some recordings should be referred to a physician for complete medical evaluation. When the diastolic pressure between 90 and 105 mmHg (mild hypertension) and he/she received good medical care, routine dental care can be performed during anxiety level reduced and vasoconstrictor dose minimized. Patients with diastolic pressure between 105 and 115 mm Hg (moderate hypertension) should be referred back to their physician to determine whether control can be improved. If the doctor reported that hypertensive patients well controlled, then dental care and emergency dental treatment can be performed in dental clinic, while the broad treatment or surgery should be performed in hospital with patient under sedation. Patients with diastolic blood pressure higher than 115 mmHg and uncontrolled have significant risk of cerebrovascular accident or myocardial infarction. Further dental treatment options which can increase blood pressure should not be made until consultation is approved and antihypertensive therapy initiated or performed again.[7,8]

Cooperation between dentist and physician is required for diagnostic and antihypertensive treatment. Upon referral from dentist, a complete physical evaluation performed by physician including blood and urine analysis as well as tunduscopic examination. An antihypertensive medication prescribed, if necessary. When the patient returns to dental clinic, dentist must ensure that patient has complied with predefined hypertension program. Regularly measure blood pressure at each appointment and ask patient if he/she is complying doctor's orders. If hypertension is well controlled or slightly elevated and patient does not have any complications of the disease, routine dental care can be provided after consultation with the physician. Patients' drug serves as indicator of hypertension severity and should be used as guidance by dental practitioners during treatment planning. Patients taking multiple antihypertensive drugs such as blockers, beta diuretics and vasodilators often have severe disease which more difficult to control than patients who only takes one or two drugs. An important factor for successful management of hypertensive patients is anxiety control. Stress can be reduced by providing a worry-free environment, good relationship, and pre-surgery or surgery anxiolytic agent (i.e. benzodiazepines or nitrous oxide). During procedures requiring sedation, monitoring should be frequent, to avoid hypoxia.[7]

There are many concerns regarding the use of vasoconstrictor in hypertensive patients. General provisions to be followed include: using smallest dose of vasoconstrictor to achieve necessary result; always do aspiration in intraoral local anesthesia; and avoid epinephrine in tooth extraction. Normal human adrenal medulla produce epinephrine 0.014 mg per minute, approximately equivalent with amount of epinephrine contained in one cartridge of local anesthetic containing epinephrine 1:100,000. Therefore, dentist should be convinced that small amount of epinephrine contained in oral local anesthetic unlikely cause cardiovascular accidents. Further guidelines have been provided by New York Heart Association, recommend that no epinephrine more than 0.04 mg given to patient with organic heart disease. This is dosage found in two cartridge of local anesthetic contained 1:100,000 epinephrine. Dental practitioner should realize alternative which can reduce risk of hypertension incident. Epinephrine can be prescribed with 1:200,000 concentration or replaced with other vasoconstrictor such levonordefrin 1:20,000. In addition, maximum dosage of epinephrine can be determined by patient's cardiovascular status (ASA risk classification), body weight, anxiety, and stress level. Dentists must recognize antihypertensive drugs and their side effects. Beta blockers are used in combination with epinephrine can cause severe elevation in blood pressure due to alpha-adrenergic stimulation. Additionally, hypotensive side effects occur in majority of patients taking antihypertensive medications. Therefore, dentist must raise seat slowly to allow normal circulation rebuilt before discharging patient. 7

3. Discussion

Hypertension has a relatively low prevalence among children compared with adults. Nonetheless, for some children, the problem is at the detection guidelines, evaluation, and treatment plan which very important in their treatment. The prevalence of hypertension among children was significantly lower (1-3%). Majority of these children only have slight increase of blood pressure and included in primary hypertension category (essential). Yet, there is a small group of children with considerably higher blood pressure, mostly suffering from secondary hypertension.

Many factors affect the elevation of hypertension in children and adolescents starting from the prenatal until natal period. In practice, dentist should know general circumstances which include signs of hypertension. Thus, dentist can already wary when treating a patient with possible hypertension. In addition, dentist must also consider drugs consumed by children and adolescent who come for treatment. If required, dentist can also collaborate with general practitioners for severe hypertension treatment patients who required initial treatment before oral and dental treatment performed. It's also important to know good patient management procedures to

avoid post-treatment complications risk due to hypertension suffered by pediatric patients.

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4. Conclusion

Hypertension is not only problem in adults, children and adolescents can also be affected by this hypertension. Management of pediatric patients with hypertension should be done carefully, it is adjusted to condition and age of pediatric patient. Similarly with dental treatment in children with hypertension, this must be done as well as possible to avoid post-treatment complications. A dentist should know clearly signs and clinical appearance of patients with or without possibility of hypertension. All dentist should have enough knowledge to get all the necessary information in recording patient medical history in order to avoid errors in treatment or post-treatment. Management of patients with severe hypertension should collaborate with general practitioner for prior hypertension treatment.

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