

Prevalence of Hypertension and Diabetes in Children

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Abstract: In 2017, the American Academy of Pediatrics issued a new clinical practice guideline for defining hypertension in children as an update to the previous Fourth Report guidelines issued in 2004. Prevalence of confirmed pediatric hypertension in children has ranged from 2% to 4% based on previous guidelines yet it is unknown what the prevalence is under the new guideline. We estimated the prevalence of elevated blood pressure, stage 1, and stage 2 hypertension by the new American Academy of Pediatrics guideline in our school-based blood pressure screening program. New prevalence estimates were compared with Fourth Report prevalence estimates in the same population by sex, age, and height factors. In 22 224 students aged 10 to 17 years screened in school as part of the Houston Pediatric and Hypertension Program at the University of Texas McGovern Medical School, the prevalence of elevated blood pressure (previously called prehypertension) increased from 14.8% by Fourth Report to 16.3% by the new American Academy of Pediatrics guideline. This increase in elevated blood pressure resulted from differential classification changes in younger and older children. Prevalence of confirmed hypertension remains at 2% to 4% in this population, however shorter children <13 years old and taller, older children 13+ years old are systematically more likely to be diagnosed with hypertension by new guidelines..

Keywords: Pediatric hypertension prevalence, American Academy of Pediatrics guideline, Blood pressure screening program, Houston Pediatric and Hypertension Program, Classification changes in hypertension



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Introduction

Hypertension is a risk factor for development of diabetic nephropathy. Previous case-control study showed hypertension as an independent factor that had a good correlation with microalbuminuria in type 1 diabetes (T1D).[1] Because of utilizing old criteria of abnormal hypertension, the prevalence of hypertension reported the same as the prevalence of essential hypertension among normal population.[2] Even nocturnal systolic blood pressure (SBP) elevation precedes the appearance of microalbuminuria.[3] The prevalence of masked hypertension in normotensive T1D mellitus (T1DM) is estimated to be around 13%. In this group, nocturnal hypertension is correlated with higher retinopathy.[4] We evaluated the prevalence of abnormal blood pressure in T1DM children with the new classification of blood pressure[5] and assessed its correlation with glomerular filtration rate (GFR) and diabetic control. Previous studies have estimated the prevalence of confirmed hypertension in children to range between 2% and 4%. These estimates were based on the 2004 Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents (FR).⁴ In 2017, the American Academy of Pediatrics (AAP) issued the new Clinical Practice Guideline for Screening and Management of High Blood Pressure in Children and Adolescents (AAP) updating the criteria for hypertension diagnosis in children [5] The Houston Pediatric and Adolescent Hypertension Program at the University of Texas McGovern Medical School at Houston conducts blood pressure (BP) screenings in middle and high schools in the Houston metropolitan area.

Literature Review

Diabetes Mellitus is a chronic disease that affects adults and children. This disease is the body's inability to produce the hormone insulin, or the body's cells' resistance to insulin secreted and its non-response to it, which causes blood sugar levels to rise more than The natural limit. It is worth clarifying that the types of diabetes that affect children are the same types that affect adults. However, in the event of diabetes, children can suffer from some psychological problems, which makes treatment a little difficult.[6] Diabetes has two main types, which are Type 1 Diabetes, and Type 2 Diabetes, and there are a number of symptoms that are similar between these two types of diabetes, and this can be illustrated with Come:[7] The symptoms of this type of diabetes often develop quickly, that is, within a short period that may be just several weeks, and the most common of these symptoms: increased feeling of thirst and the need to urinate. Feeling hungry more than normal. Weight loss. Feeling of fatigue and general fatigue. Irritability and instability. The appearance of an aroma similar to that of fruits from the patient's breath[8]. Infection with a fungal infection, especially in females The symptoms of this type of diabetes usually appear gradually, and the child may not be diagnosed until after months or several years have passed, and one of the most common symptoms in the case of suffering from this type of diabetes in children is: The frequent need to urinate, especially at night . Increased feeling of thirst and fatigue. Undue weight loss. Itching around the genitals, usually due to fungal growth or the like. Slow healing of wounds and sores. Suffering from polycystic ovarian syndrome (also known as polycystic ovarian syndrome) in females. Acanthosis nigricans, the appearance of black spots on the skin as a result of the cells' resistance to insulin. Blindness due to dry eye lens Diabetes, which can affect children, has two main types, as we have shown, and can be illustrated as follows: This type of diabetes is represented by the inability of the pancreas cells to produce the insulin hormone responsible for controlling blood sugar levels due to the exposure of the pancreas cells to attack the immune system in the body itself by mistake, and this is why diabetes is

one of the first types of autoimmune diseases (in English: Autoimmune Disease), and some have explained the occurrence of this disorder as a result of the child's exposure to some environmental factors in addition to carrying some genes responsible for increasing the chance of developing diabetes, and it has been found that children with type 1 diabetes are more likely to suffer from some other autoimmune disorders, such as Celiac disease is known among the general public as wheat allergy, as well as thyroid diseases. It should be noted that type 1 diabetes is more common among children than type 2 diabetes, as it records two-thirds of cases, and that most cases It is diagnosed between the ages of four and six, or 12-14 years.[9] This type of diabetes is rare among children, but it is worth noting that the risk of suffering from this type of diabetes increases with increasing weight and obesity, and type II diabetes is the failure of the body cells to respond to insulin, in addition to insulin production over time In fact, the occurrence of this type of diabetes is not due to the presence of an autoimmune disease, but rather to the interaction of a number of environmental and genetic factors that differ between the infected and the people, including obesity, the family history of the disease, and race.[11] Treating cases of sugar in them depends on giving the child insulin injections to compensate for the shortage in the body, in addition to the need to develop a food plan for the child that addresses his need for carbohydrates and foods necessary for his growth and at the same time without causing them to raise blood sugar levels in a way that exceeds the required goal, this It is imperative to develop a plan for the child to exercise because of its effect on blood sugar levels, and finally it is worth teaching the child and those with appropriate methods to properly deal with the disease.[6] Treatment for this type mainly depends on the child changing some of his daily habits and lifestyles, such as stimulating him to exercise, lose weight, and eat healthy food, and the person in his life may need to take certain types of medications that are given orally to control the levels of sugar in Blood or maybe I need insulin, or both treatment options.[9,10].

Results and Discussion

This study revealed that rate of pre-hypertension is nine-times higher than the normal population. The abnormal blood pressure was related to SMR and GFR in diabetic patients. Nørgaard et al. studies in a large population of Danish people and reported the prevalence of hypertension was at least 3.5 times higher in adults with T1DM and the clinical nephropathy was seen in 4% of this group.[11] However, only 11% of our diabetic patients had hypertension and one-third was in pre-hypertensive stage. Okada et al. assessed glomerular filtration in pre-diabetic and pre-hypertensive in a large number of people who went under check-up. The result was the relation between the hyperfiltration and pre-diabetic and prehypertensive stage.[12] This reflected the importance of early diagnosis of abnormal blood pressure and blood glucose level to protect the kidney from hyperfiltration. Similarly, abnormal blood pressure in diabetic patients in our study group was associated with eGFR; moreover, systolic hypertension was correlated with hyperfiltration. Wilkinson et al. studied 35 T1DM and 35 controls who had matched blood pressure evaluated for endothelial dysfunction. They observed that T1D patients had increased systemic stiffness and augmentation index.[13] Another study shows that the presence of hypertension and white coat hypertension in children with T1D are associated more with arterial stiffness when they are compared with normotensive T1D.[14] The impaired baroreceptor reflex might have a role in the night time hypertension or non-dipper status in diabetic children.[15] The duration of diabetes was surprisingly longer in pre-hypertensive patients. We had no justification for this finding. Although, pre-hypertensive patients had higher HA1C level and BMI than hypertensive and normotensive patients.

Hypertension in diabetic patients might be a coincident finding during our evaluation. However, we could not rule out the possibility of white-coat hypertension in this group. In addition, the diabetic adolescent in puberty stage had a higher rate of abnormal blood pressure. This finding emphasizes the influence of hormonal changes in diabetic cases. This association was absent in healthy adolescent. Lurbe et al. monitored 75 adolescents with T1DM longitudinally to assess the time correlation between night time hypertension and occurrence of microalbuminuria. The patients' blood pressures were recorded by ambulatory blood pressure monitoring at the time of enrolment to study and 2 year later. They found elevated night time blood pressure preceded microalbuminuria.[3] In our study, we did not find any correlation between stage of blood pressure and microalbuminuria. It signifies that microalbuminuria is either insensitive or late marker of diabetic nephropathy. Correct blood pressure measurement and interpreting according the new classification of blood pressure are more important than considering microalbuminuria as a sole an alarm for incipient nephropathy. Pre-hypertensive diabetic patients observed more in those who reached to pubertal stage or had higher BMI. Thorn studied the incidence of metabolic syndrome in more than 2000 T1D and found that the odd ratio of diabetic nephropathy increased more than three folds in diabetic patients with metabolic syndrome.[16] In our study, there was no correlation between HbA1C and abnormal blood pressure. Chen et al. observed that poor controlled type 2 diabetes had a higher rate of hypertension, arterial stiffness.[17] This association was not found in normotensive T1DM patients. A nation-wide study was done by Raile et al.; hypertension, HbA1C, duration of disease and hyperlipidemia increased risk of diabetic nephropathy, in contrast childhood diabetic onset was protective.[18] It was interesting that GFR based creatinin was associate with abnormal blood pressure compared to cystatin-c. However, cystatin-c is recommended as sensitive marker to creatinin for estimating GFR. Our previous study had shown that GFR based cystatin-c formulas in diabetic patients were not accurate at least in higher level of GFR.[19] Small sample size, the absence of 24 h blood pressure measurements and absence of lipid profile measurements were limitation of this study.

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