ORIGINAL ARTICLE

PREVALENCE OF HYPERTENSION IN HEALTHY PRIMARY SCHOOL CHILDREN IN THE KLANG VALLEY

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Abstract

The objective of the study was to determine the prevalence of hypertension in healthy primary school children. A cross-sectional survey by manual blood pressure measurement of healthy children aged 6–12 years attending a national type school was carried out. Children with previous renal, cardiac and endocrine disorders were excluded. Korotkoff 1 represented the systolic blood pressure (SBP) and Korotkoff 5 was taken as the diastolic blood pressure (DBP). Hypertension was defined as the SBP or DBP above the 95th centile according to age group and sex regardless of ethnicity. A total of 1756 children were studied with 895 boy and 861 girls. The results showed that 109 children (6.2%) were found to have hypertension and the incidence was similar in boys and girls (6.4% vs 6.0%, p = 0.69). Fifty-three (48.6%) children had an elevated SBP and the DBP was elevated in 43 (39.4%) children. Only 12 (12.0%) children had both elevated SBP and DBP. Children found to have hypertension were more likely to be Chinese (p = 0.009) and obese (p = 0.04). In conclusion the overall prevalence of hypertension in children aged 6–12 years based on a single blood pressure measurement was 6.2%. Hypertension was more likely to be found in Chinese children and those who were obese.

Key words : *Blood pressure; hypertension*

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Introduction

Hypertension in association with ischaemic heart disease is the most important cause of morbidity and mortality in adulthood for developed nations. Malaysia in its quest for development and attaining a standard of living comparable to developed nations has begun to experience this worrisome trend.[1] The problem of hypertension is less common in children and is traditionally considered to be secondary in origin, a manifestation of an undiagnosed underlying disorder. The importance of childhood blood pressure measurement in healthcare has nonetheless undergone conceptual changes in the last two decades. The original orientation of blood pressure examination in children was to identify a secondary cause of hypertension and treatment of this underlying disorder would cure the hypertension. The recognition of an elevated

blood pressure in a healthy child with no underlying disorder is now gaining importance as it may predict essential hypertension in adulthood.[2,3] Blood pressure measurement is not routinely done in healthy asymptomatic Malaysian children and only carried out during visits or ward admission to healthcare centres for an unrelated illness where the appropriate equipment and personnel familiar with blood examination in children are available.

We set out to determine the prevalence of hypertension in healthy school going children aged 6–12 years who reside in the Klang Valley. A universal screening of children regardless of ethnicity was initially done to determine the 95th percentile cut-off values for systolic and diastolic blood pressure.

Material and methods

Subject selection

The study design was a cross-sectional survey of primary school children attending a national type school (Sekolah Rendah Kebangsaan). The subjects chosen were healthy and aged between 6–12 years. Subjects with previous renal, cardiac or endocrine problems and those who attended physical education lessons on the day of sampling were excluded. The date, time, weight, height, race and age were also recorded. The body mass index (BMI) was calculated for each subject using the formula weight/height.[2] A BMI exceeding 30 was indicative of obesity.[4]

Blood pressure measurement

Blood pressure of the right arm was measured manually using a standard clinical sphygmomanometer (mercury column). The size of the sphygmomanometer should cover at least 80% of the upper arm i.e. lower acromian to olecranon process and the length of the inflatable bladder should encircle the limb completely or almost completely. The subject should be adequately rested and sitting with the right arm supported, horizontal and at the heart level. Every effort was made to minimize factors that might affect blood pressure such as fear, crying, laughing and recent activity.

The systolic pressure (SBP) was initially estimated by palpation. While palpating the radial artery, the cuff was inflated until the pulse was no longer palpable. The cuff was then inflated to a further 30 mmHg and then slowly deflated. The pressure at which the pulse is palpable was the estimated SBP. The cuff was then re-inflated to 30 mmHg above the estimated SBP and the stethoscope was placed over the brachial artery pulse, proximal and medial to the cubital fossa and below the bottom edge of the cuff (ie about 2cm above the cubital fossa). The bladder was then deflated at a rate of 2–3 mmHg per pulse beat. Auscultatory sounds of Korotkoff 1 phase was taken as the SBP and Korotkoff 5 phase was taken to represent the diastolic blood pressure (DBP). Readings were taken to the nearest even mmHg. In subjects where the mercury level was between two even markings, the lower even value was taken. A second measurement was then taken at least 30 seconds from the first with the cuff totally deflated. The average of the two readings was calculated and used for analysis.

Definition of hypertension

Hypertension was defined as the mean SBP or DBP geater than or equal to the 95th percentile for age and sex regardless of ethnicity for the study population.[5,6] Subjects with no Korotkoff 5 phase were considered to have no hypertension.

Statistical analysis

The subjects were then divided into age groups of 6–7 years, 7–8 years, 9–10 years, 10–11 years and 11–12 years for analysis. Data collected was analysed using a statistical programme SPSS version 7.5 to determine percentile distribution for each age group and sex regardless of ethnicity. The students 't' test was used to compare quantitative data and the chi-square test was used for dichotomous variables. A p-value of less than 0.05 was considered significant.

Results

Blood pressure was measured in a total of 1756 children of whom 895 were boys and 861 were girls. The majority of subjects were Malay children (88%) with an equal proportion of Chinese (5.6%) and Indians (5.9%). Six (0.5%) children were Indonesian. Tables I and II show the 95th percentile cut-off values for SBP and DBP of the study population with regards to age group and sex regardless of ethnicity.

One hundred and nine children were found to have hypertension with an overall prevalence of 6.2%. The SBP was elevated in 53 (48.6%) of them and the DBP was elevated in 43 (39.4%) of them. Only 13 (12.0%) children had elevation of both the SBP and DBP. There was no difference in the prevalence of hypertension with regards to sex (6.4% in boys and 6.0% in girls, p-value = 0.69) and between the various age groups (Table III). However, hypertension was more likely found in Chinese children compared to Malay or Indian children (15.1% vs 5.7% vs 5.8% respectively, p value = 0.009). Although only 12 (0.7%) children had a BMI indicative of obesity, hypertension was more likely to be associated with obesity (2.8% vs 0.6%, p value = 0.04).

Table I. Ninety-fifth centile values for systolic and diastolic blood pressure for boys aged 6–12 years (N = 895)

Age group (years)	Number	Systolic blood pressure (mmHg)	Diastolic blood pressure (mmHg)
6 – 7	130	110	72
7 – 8	136	120	73
8 – 9	140	123	80
9 – 10	130	124	81
10 – 11	175	130	84
11 – 12	184	130	84

Table II. Ninety-fifth centile values for systolic and diastolic blood pressure for girls aged 6–12 years (N = 861)

Age group (years)	Number	Systolic blood pressure (mmHg)	Diastolic blood pressure (mmHg)
6 – 7	140	110	75
7 – 8	116	118	76
8 – 9	164	123	79
9 – 10	141	126	80
10 – 11	147	127	84
11 – 12	153	129	85

Table III. Age group distribution and incidence of hypertension (N = 1756)

Age group (years)	Number of subjects	Number with hypertension	Incidence
6 – 7	270	17	6.6%
7 – 8	252	14	5.6%
8 – 9	304	19	6.3%
9 – 10	271	14	5.2%
10 – 11	322	28	8.7%
11 – 12	337	17	5.0%

Discussion

An elevated blood pressure found in children is commonly attributed to secondary causes like renal disease, reno-vascular disorders and endocrine disorders. These problems however only come to the attention of the medical care-giver when they present to a medical facility with accelerated hypertension or systemic symptoms. The approach to an elevated blood pressure in a healthy child with no underlying illness is gaining importance as the magnitude and the significance of this problem is starting to be recognised. Although the elevated blood pressure does not appear to pose any immediate risk to the asymptomatic child, preliminary studies in these children have shown significant haemodynamic and cardiac ventricular adversities consistent with those found in hypertensive adults.[7,8] Several longitudinal studies have shown that an elevated blood pressure in childhood may herald the onset of adulthood essential hypertension.[2,3] It is very likely that hypertension and its associated morbidity like ischaemic heart disease and cerebrovascular accidents in adulthood may be prevented by early intervention in children identified to have an elevated blood pressure. Weight reduction in obese children has shown promising results by normalising the blood pressure and even improving their serum lipids levels.[9,10] The use of a low salt diet in reducing the blood pressure has been less successful in children and adolescents compared to adults with hypertension.[11] These observations provide argument for screening of hypertension in children and even as far as to incorporate it as part of the school health services. As yet, healthy asymptomatic children do not undergo routine blood pressure examination screening and therefore poses a significant hurdle in making childhood prevention of adulthood essential hypertension possible.

Mass screening of healthy children for hypertension is not routinely carried out mainly due to the difficulty in obtaining accurate blood pressure measurement. Blood pressure measurement reproducibility in children at different environments and times is unsatisfactory and compounds the interpretation of these measurements. The prevalence of hypertension in our study population is comparable to the 3–12% found in several cross-sectional studies.[12–14] However, longitudinal blood pressure measurement studies in children have shown that this prevalence falls to 1% or less when the blood pressure is re-examined at later intervals.[15–17] These studies clearly demonstrate that cross-sectional surveys cannot

accurately determine the prevalence of hypertension in healthy children and further compound the selection and timing of children for intervention.

The findings of our study overestimate the actual prevalence of hypertension in our study population due to arguments and reasons as aforementioned. Repeat blood pressure examinations in these children found to have an elevated blood pressure was desirable but not carried out due to logistic and time constraints. Nonetheless, the prevalence of hypertension found is a reflection of the potential magnitude of the problem in Malaysian children and requires further evaluation that address the need for longitudinal tracking of the blood pressure.

The prevalence of hypertension was highest among Chinese children but as the ethnic distribution of the study population was unequal, this finding remains an interesting observation with its significance questionable. The overall prevalence of obesity in our study population was rather low but as expected, obese children were more likely to have hypertension. It is usually assumed that a technical error of an inadequate cuff size contributes to the elevated blood pressure found in obese individuals but we were careful to ensure that all children examined fulfilled the required criteria of cuff size. Obesity is clearly associated with an elevated blood pressure but this association is more likely a causal one wherein obesity contributes to a higher blood pressure and risk for cardiovascular disease.

Introduction of blood pressure examination as part of the routine medical assessment carried out by school health services is desirable but will be a monumental undertaking as such a programme will require appropriate equipment and trained medical field personnel. More importantly, a comprehensive intervention programme that utilizes both pharmacological and non-pharmacological strategies for hypertensive children will also need to be organised. The low prevalence of hypertension after repeat blood pressure examinations will make this exercise not cost-effective and difficult to justify. It may be more appropriate to introduce health education programmes in schools that promote a healthy lifestyle such as a healthy diet, regular exercise and weight reduction for obese children, all of which will reduce the prevalence of hypertension.

Conclusion

Our study demonstrated that a small but significant number of healthy Malaysian children have an elevated blood pressure with universal single measurement screening. However, continuous evaluation is required to identify those children who continue to have a persistently elevated blood pressure by repeat blood pressure measurements. With the problem of hypertension and ischaemic heart disease escalating among adults in Malaysia, the prospect of early intervention by identifying these high-risk subjects during childhood provides a promising avenue of primary prevention.

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