Prevalence of Hypertension and Factors Associated among Malay Adolescents, Putrajaya.

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Introduction

Hypertension is a known public health problem in adults, but, in childhood and adolescents, it much less appreciated

Aglony M, Aceredo M, Abrosili L. (2009) Hypertension in adolescents.Expert Rev. Cardiovasc Ther. Dec. 7 (12): 1595-603

The prevalence and rate of hypertension in children appears to be increasing

Sarof JM, Lei D, Turner J, Polferiberger T, Portman CJ. (2004) Overweight, ethnicity and the prevlence of hypertension in school-aged children. Paediatrics, 113 (3ptl):475-82

There is evidence that childhood hypertension can lead to adult hypertension.

Lauer RM, Clarke WL. (1989) Childhood risk factors for high adult blood pressure: the Muscatine Study. Paediatrics . 84:63-41

Blood pressure in youth is a useful predictor of essential hypertension in adulthood

Lauer RM, Clarke WL. (1989) Childhood risk factors for high adult blood pressure: the Muscatine Study. Paediatrics . 84:63-41
Nelson MJ, Ragland DR, Syme SL.(1992) Longitudinal prediction of adult blood pressure from juvenile blood pressure levels. Am J Epidemiol. 136:663-645

Hypertension is a known risk factor for coronary artery disease (CAD) in adults and the presence of hypertension in childhood may contribute to early development of CAD. Reports showed that early development of artherosclerosis does exist in children and young adults and may be associated with childhood hypertension

Berenson GS, Srinivasan SR, Bao W, Newman WP 3rd, Tracy RE, Watligney WA. (1998) Association between multiple cardiovascular risk factors and artherosclerosis in children and young adults: the Bogalusa heart study. N Engl J Med. 338:1650-6

Among adolescents and young adults; elevated blood pressure is also associated with the presence of early artherosclerotic lesions

Newman WP, Freedman DJ, Voors AW. Relations of serum lipoprotein levels and systoic blood pressure to early artherosclerosis: The Bogalusa Heart Study. N Eng J Med; 314: 138-144

Overweight and obese children had significantly higher blood pressure values than normal subjects

Schiel K, Beltschikow W, Kramer G, stein G (2006) Overweight, obesity and elevated blood pressure in children and adolescents. Eur J Med Res. Mar 27; 11(3): 97-101

In the US, blood pressure has increased among children and adolescents over the last decade; which is partially attributed by increase prevalence of overweight.

Muntner P, Jiang H, Cutler JA,Wildman RP, Whelton PK (2004). Trends in blood pressure among children and adolescents. JAMA; 291:2107-2113.

OBJECTIVE

To determine the prevalence of hypertension and factors associated among Malay secondary school students in Putrajaya

MATERIALS AND METHODS

- A cross-sectional study done in Putrajaya, Malaysia.
- From a sampling frame of 12 schools, 3 schools were randomly selected.
- All Malay students aged 13-17 years were included and interviewed by trained interviewers using pretested validated questionnaire.
- Verbal consent obtained prior to interview.

MATERIALS AND METHODS

- Standardized format questionnaire collect data on age, gender, family history of hypertension.

MATERIALS AND METHODS

Blood Pressure measurement

- Three measurements taken using sphygmomanometer after respondents had rested at least 5 minutes.
- Systolic blood pressure (SBP) – average of 3 SBP readings
- Diastolic blood pressure (DBP) – average of 3 DBP readings

MATERIALS AND METHODS

- The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents was used in this study to classify the respondents into normal, prehypertension and hypertension.

National High Blood Pressure Education Program working Group (2004) The fourth report on the diagnosis, evaluation and treatment of high blood pressure in children and adolescents. Paediatrics. 114:555-76

- Normal – average SBP or DBP levels less than 90th percentile,
- Prehypertension – average SBP or DBP greater than or equal to the 90th percentile but less than 95th percentile,
- Hypertension – average SBP and/or DBP was greater than or equal to the 95th percentile; for gender, age and height

National High Blood Pressure Education Program working Group (2004) The fourth report on the diagnosis, evaluation and treatment of high blood pressure in children and adolescents. Paediatrics. 114:555-76

Anthropometric measurements

- Weight was recorded using the digital bathroom scale TANITA model HD-312. After each respondent, the weighing machine was reset to zero and checked frequently using a known weight.
- Height was measured by using SECA Body meter Model 208.
- Two measurements were taken for both weight and height. Average of the two values were used in the analysis.

DATA ANALYSIS

- Statistical analysis done using SPSS version 18. Categorical variables were presented as frequencies and percentages.
- The Pearson's *chi-square test* (χ^2) test was used to determine the associations between categorical variables.
- Continuous variables were presented as means with their 95% confidence interval (CI) and standard deviation. Pearson correlation coefficient was performed to determine the correlation between two continuous variables.

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RESULTS

Mean Blood Pressure Levels by Gender

Gender	No.	SBP (mmHg)			DBP		
		Mean	95%CI	SD	Mean	95%CI	SD
Male	899	111.7	110.8 – 112.5	12.9	63.5	62.8 – 64.2	10.8
Female	879	106.0	105.2 – 106.8	12.0	62.9	62.3 – 63.6	9.4
Both gender	1778	108.9	108.3 – 109.5	12.8	63.2	62.8 – 63.7	10.1

Prevalence of Hypertension by Gender, Family History and Nutritional Status

	Normal BP	Pre-hypertension No. (%)	Hypertension No. (%)	Total
Gender				
Male	637 (70.9)	146 (16.2)	116 (12.9)	899
Female	738 (84.0)	51 (5.8)	90 (10.2)	879
Both	1375 (77.3)	197 (11.1)	206 (11.6)	1778
Family History				
Yes	557 (77.5)	76 (10.5)	86 (12)	719
No	818 (77.3)	121 (11.4)	120 (11.3)	1059
Nutritional status				
Lean	172 (9.5)	10 (5.3)	6 (3.2)	188
Normal	971 (83.8)	11.3 (9.7)	75 (6.5)	1159
Overweight	149 (66.8)	37 (16.6)	37 (16.6)	223
Obese	83 (39.9)	37 (17.8)	88 (42.3)	208

Correlation between BMI and Blood Pressure

	r	r^2	*p*-value[a]
Systolic Blood Pressure	0.52	0.27	0.001
Diastolic Blood Pressure	0.38	0.15	0.001

[a] Pearson's correlation, level of significance 0.05

Systolic Blood Pressure by Age in Males

Age (Years)	No.	Systolic blood pressure (mmHg)					
		Mean	95% CI	SD	F	df	*p* -value[a]
13	180	106.8	104.8-108.7	13.3			
14	251	109.9	108.4-111.4	12.0			
15	213	111.8	114.8-119.0	11.7			
16	120	116.9	114.2-118.8	11.7			
17	135	116.5	110.8-112.5	12.9			
Total	899	111.7	110.8-112.5	12.9	18.95	4	<0.05

[a] One-way ANOVA, significance level p<0.05

Systolic Blood Pressure by Age in Females

Age (Years)	No.	Systolic blood pressure (mmHg)					
		Mean	95% CI	SD	F	df	*p* -value[a]
13	168	105.1	103.3-107.0	12.1			
14	204	104.3	102.7-105.8	11.2			
15	251	105	104.0-106.9	11.6			
16	152	108.9	106.5-111.3	12.6			
17	104	108.9	106.5-111.3	12.4			
Total	879	106.0	105.2-106.8	12.0	4.54	4	0.001

[a] One-way ANOVA, significance level p<0.05

CONCLUSION & RECOMMENDATION

- Prevalence of hypertension and pre-hypertension is high among school children aged 13-17 years in Putrajaya.
- BMI is significantly correlated to hypertension among adolescents.
- Risk factors for cardiovascular diseases are already present in school children aged 13 to 17 years in Malaysia

- There is an urgent need for implementation of a comprehensive CVD prevention program in schools which include education on healthy eating and physical activity

- Routine blood pressure measurements should be taken in school children to improve the detection, prevention and treatment of hypertension.

- However, involvement of people at all levels especially policy-makers and implementers including Parent Teachers Association, NGO's, teachers and parents should be emphasized for effective intervention programs.

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