A STUDY OF PREVALENCE OF ESSENTIAL HYPERTENSION IN SCHOOL GOING EARLY AND MID-adoLESCENT CHILDREN OF RURAL AREA IN BHOPAL

Rakesh Mishra¹, Astha Tiwari², Shweta Anand³, Roshan Chanchlani⁴

HOW TO CITE THIS ARTICLE:
Rakesh Mishra, Astha Tiwari, Shweta Anand, Roshan Chanchlani. "A Study of Prevalence of Essential Hypertension in School Going Early and Mid-Adolescent Children of Rural Area in Bhopal". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 23, June 09; Page: 6401-6406,
DOI: 10.14260/jemds/2014/2755

ABSTRACT: OBJECTIVE: The general objective of the study is to find out prevalence of essential hypertension among early and mid-adolescent of school going children of rural area Bhopal.

METHODS: Blood pressure was recorded in 960 apparently normal school students in 10 to 16 yr age group as per standard guidelines. Detailed clinical examination was done in all cases. A detailed questionnaire was sent to parents. RESULTS: 8.3% of adolescents had high blood pressure at the end of fourth screening. The systolic and diastolic hypertensions were documented. CONCLUSION: Multiple blood pressure recordings are essential for accurate diagnosis of hypertension. There is a high prevalence of essential hypertension amongst adolescents in Bhopal rural area.

KEYWORDS: essential hypertension adolescence.

INTRODUCTION: Essential hypertension (Primary Hypertension) is a common disease worldwide and is associated with increased risk of myocardial infarction, stroke and cardiovascular mortality in adults.¹ This essential hypertension is detectable in the young and may track into adulthood.²-⁷ There is proof that even asymptomatic adolescents with mild blood pressure elevation can have evidence of target organ damage.

However, this hypertension goes undetected unless specifically looked for. Therefore, according to the recommendation of the fourth report from the National high B.P education program (NHBPEP) working group - all children above 3 years of age, seen in medical care should have their blood pressure (B.P) measured routinely.⁸ Various factors are known to influence onset of this essential hypertension in childhood. Family history of hypertension³,⁴,⁵,⁹ and obesity in the child as well established risk factors.¹⁰-¹³

This can be prevented by early detection of hypertension and modifying its risk factors.¹⁴

There is a wide variation in the prevalence of hypertension.⁵ The prevalence of hypertension in children is reported to range from a high of 16.2% to a low of less than 1%.¹⁵-¹⁸ This diversity in prevalence of hypertension is due to the varying age groups taken for the study and different criteria adopted for defining hypertension, basic differences between racial sub-groups related to geographic, dietary and cultural factors.

The present study was conducted to evaluate the prevalence of hypertension in apparently' healthy school children in a rural area of Bhopal.

MATERIAL AND METHODS: The present cross-sectional study was a school based survey conducted from June 2011 to August 2012 at Fanda and Tumda rural blocks which are the field practice area of Chirayu Medical college, Bhopal. 960 apparently normal school students in early and mid-
adolescence (10 years to 16 years) were selected by systematic sampling. The sample size was calculated to be 934 (p=16%, d=15%, C.I. =95%). Children with any cardiac disorders, renal disorders, any chronic illness or history of any drug intake known to influence blood pressure were excluded from the study.

A detailed questionnaire was sent to parents, which included history of health related complaints in the child, history of drug intake in the child, family history of hypertension or other cardiovascular events, dietary history of child and physical activity of the child.

Age was verified from school records and rounded off to completed years. Detailed anthropometry including Body mass index and waist - hip ratio were done in each child as per standard norms. All children aged 10 to 16 years studying in grades 6 to 10 were enrolled into the study. Systematic sampling was the sampling technique used based on their roll numbers of the class so that each children has the chance of being included in the study.

Before recording the blood pressure, the procedure was fully explained to the child and was made to sit quietly for five minutes. Blood pressure was recorded in sitting position in right arm with cubital fossa at heart level, by mercury sphygmomanometer. The appropriate sized cuff was selected with the bladder width about 40% of the arm circumference at a point midway between olecranon and acromion and the bladder length covering at least 80% to 100% of the circumference of the arm. If cuff is too small, the next larger cuff was used. The first and fifth phases of Korotkoff sounds were taken as indicative of the systolic and diastolic blood pressures respectively.

Three measurements were taken at intervals of five minutes each and systolic blood pressure and diastolic blood pressure were categorized. The percentile charts based on gender, age and height provided by NHBPEP were used for classification of blood pressure. The child was considered normotensive if the blood pressure was less than 90th percentile. If the blood pressure was > 90th percentile or > 120/80mm Hg (even if < 90th percentile) BP was rechecked at the same visit after one hour.

If BP was persistently abnormal even in the second screening, BP was rechecked twice at one week interval. If at the end of fourth screening, BP was persistently elevated to between >90th percentile to 95th percentile or >120/80mm Hg (even if <90th percentile), child was considered as having prehypertension. If BP at the end of fourth screening was >95th percentile, child was considered as having hypertension. All children with abnormal BP were subjected to baseline investigation like urinalysis, urine culture, Blood urea Nitrogen, Serum creatinine, Serum electrolytes, renal ultrasound and complete blood count.

The collected data were entered and analyzed using Epi Info 2000 (Center for Disease Control and Prevention, Atlanta, Georgia, USA) and SPSS version 16 (SPSS 16.0 for Windows, release 16.0.0. Chicago: SPSS Inc). Frequencies of all variables were taken to check frequencies. Mean and standard deviation (SD) were calculated for continuous variables.

RESULT: A total of 960 students were included between the age group of 10 years- 16 years amongst which 515(53.3%) were male and 445 (46.7%) were female. Of these 695(72.3%) were in early adolescent age (10-13 yrs) and 265 (27.7%) in mid adolescent age (14-16 yrs) Table no. 1. Mean age of males was 13.61 years ± 4.6 and mean age of females was 13.57 years ± 4.2. At the end of fourth screening, a total of 79(8.3%) had abnormal blood pressure. Of these cases, 21 cases had systolic
hypertension only, 19 cases had diastolic hypertension only and 39 cases had both systolic and diastolic hypertension.

The different grades of hypertension are shown in table no. 2. In the present study age of mother and father did not have significant association with hypertension. There was no age or sex predilection for hypertension. Family history of hypertension was present in 36% of the cases as against 27% of the control, which was not significant. Baseline investigations of the hypertension children did not reveal any cause.

**DISCUSSION**: Out of 960 students enrolled in our study there were 695(72.3%) children aged 10-13 yrs (early adolescence), and 265(27.7%) children aged 14-16 yrs with a male to female ratio of 1.15:1. The prevalence of hypertension in our study was 4.4%. The prevalence in various other Indian studies ranges from 0.46% to 11.9.5,20,21 Also the prevalence of hypertension in children is reported to range from (1-16.2%) taking into consideration various studies across world.15-18

This wide difference may be due to different standards used for diagnosis of hypertension. Some studies have adopted fourth phase of Korotkoff sound to define diastolic blood pressure while others have taken fifth korotkoff sound to define diastolic blood pressure. Some studies have not taken the height of the children into consideration while grading the BP. Higher prevalence has been reported in some specific parts of the world and country like in Southern India.

The distribution of hypertension across three screenings, showed significant reduction in systolic hypertension from 21.4% in first screening to 6.25. 8% in the fourth screening and that of diastolic hypertension from 17.8% to 6.04%. This results confirms the need of repeated measurement in the correct diagnosis of hypertension.8,20

Other studies also showed a substantial decrease of BP in children when measures were repeated on different occasions. In a study done in 1979, among 10 641 US children in Dallas22, 8.9% children were found to have elevated BP at the first visit. At third visit some days later, only 1.2% had systolic hypertension and 0.4% had diastolic hypertension. In the Muscatine Study, 23 out of 6662 children, 13% had elevated BP at the initial screening visit while less than 1% had persistent elevated BP based on repeated measurements taken on separate occasions.

Though diastolic blood pressure is not given much significance in pediatric age group, 3.4% of our school children had diastolic hypertension compared to systolic hypertension of 2.8% after third screening. There was no age or sex predilection in our study. Some of the studies have found increased prevalence of hypertension in girls, which they attributed to hormonal changes around puberty.7,10 However, some studies have found no sex differences in the prevalence of hypertension.20

Family history of hypertension was present in 45.2% of hypertensives as against 31.4% of non-hypertensives, which was not statistically significant. However, family history of hypertension is a well-established risk factor.3,4,5,9 some studies have shown association with maternal hypertension2-3 while some showed association with paternal hypertension.9

However, in the present study even though there was an increased association of these cardiovascular events in families of hypertensive, it was not statistically significant. This is probably because of a small sample of hypertensive in the present study. Routine baseline investigations failed to reveal any underlying cause for hypertension in all our hypertensive. Therefore, in view of mild hypertension in apparently normal adolescents with baseline investigations being normal, a diagnosis of essential hypertension was done in the present cases.
CONCLUSION: Multiple blood pressure recordings have to be done for accurate diagnosis of hypertension. The prevalence of essential hypertension in our study was 8.3%. The systolic and diastolic hypertensions have been documented in our study. Adolescents must be routinely screened to detect asymptomatic hypertension. Advice on risk factor modification by appropriate lifestyle changes may prevent long term effects of hypertension on target organs.

REFERENCES:
1. Taskforce in blood pressure control in children. Report of the second taskforce on blood pressure control in children. Pediatrics 1987; 79: 1-25.
2. Whin cup PH, Cook DG, Shaper AG. Early influences in blood pressure: a study of children aged 5-7 years. BMJ 1989; 299: 587-591.
3. Munger RG, Prineas RJ, Gomez - Marin O. Persistent elevation of blood pressure among children with a family history of hypertension; the Minneapolis children's blood pressure study. J Hypertens 1988; 6: 647-653.
4. Guptha AK. Influence of family history of morbidity cardiovascular events on blood pressure levels of school children. Indian Pediatrics 1991; 28: 131-139.
5. Chadha SL, Tandon R, Shekhawat S, Gopinath N. An epidemiological study of blood pressure in school children (514 years) in Delhi. Indian Heart J 1999; 51: 178-182.
6. Bernstein D. Systemic hypertension. In Behrman RE, Kliegman RM, Jenson HB eds. Nelson Text Book of Pediatrics. 17th ed. Philadelphia; WB Saunders Co., 2004; 1592-1598.
7. Sinaiko AR. Hypertension in children. NEJM 1996; 335: 1968-1973.
8. The fourth report on the Diagnosis, Evaluation and Treatment of high blood pressure in children and adolescents. National High Blood Pressure Education Program working group on High Blood Pressure in Children and Adolescents. Pediatrics 2004; 114: 555-576.
9. Burke V, Gracey MP, Beilin LJ, Milligan RA. Family history as a predictor of blood pressure in a longitudinal study of Australian Children. J Hypertens 1998; 16: 269-276.
10. Genovesi S, Giussani M, Pieruzzi F, Vigorita F, Arcovio C, Cavuto S, Stella A. Results of blood pressure screening in a population of school aged children in the province of Milan. Role of overweight. J Hypertens 2005; 23: 493-497.
11. Sorof JM, Lai D, Turner J, Poffenbarger T, Portman RJ. Overweight, ethnicity and the prevalence of hypertension in school aged children. Pediatrics 2004; 113: 475-482.
12. Falkner B, Gidding SS, Ramirez - Garnica G, Wiltrout SA, West D, Rappaport EB. The relationship of body mass index and blood pressure in primary care Pediatric patients. J Pediatr 2006; 148: 195-200.
13. Verma M, Chhatwal J, George SM. Obesity and hypertension in children. Indian Pediatrics 1994; 31: 1065-1069.
14. Sukumar IP, Alurkar VM. Systemic high arterial pressure in children. Indian Heart J 1978; 30: 69.
15. Hahn L. The relation of blood pressure to weight, height and body surface area in school boys aged 11-1 years. Arch Dis Child 1952, 27: 43-53.
16. Rames LK, Clarke WR, Cornor WE, Reiter MA, RM. Normal blood pressure and the evaluation of sustained blood pressure elevation in childhood-the Muscatine study. Pediatrics 1978, 61: 245-257.
17. Gupta AK, Ahmad AJ. Normal blood pressure and the evaluation of sustained blood pressure elevation in childhood. Indian Pediatr 1990, 27: 33-42.

18. Sachdev Y. Normal blood pressure and hypertension in Indian Children. Indian Pediatr 1984, 21: 41-48.

19. Desai AB, Mukherjee D. Growth and development basic concepts. In Parthasarathy A, Agarwal KN, eds. IAP text book of Pediatrics, 3rd ed. New Delhi; Jaypee Brothers Medical Publishers (P) Ltd. 2006; 73-77.

20. Sainaiko AR, Gomez Marin O, Prineas RJ. Prevalence of "Significant" hypertension in junior high school aged children: The children and adolescent blood pressure program. J Pediatr 1989; 114: 664-669.

21. Mohan B, Kumar N, Aslam N, Rangbulla A, Kumbakarani S, Sood NK, Wander GS. Prevalence of sustained hypertension and obesity in urban and rural school going children in Ludhiana. Indian Heart J 2004; 56: 310-314.

22. Lauer RM, Burns TL, Clarke WR, Mahoney LT. Childhood predictors of future blood pressure. Hypertension 1991; 18: Suppl 1: I-741-I-81.

23. Burns TL, Moll PP, Lauer RM. Increased familial cardiovascular mortality in obese schoolchildren: the Muscatine Ponderosity Family Study. Pediatrics 1992; 89: 262-8.

Table no. 1: Age and sex distribution of school children

| Age (years) | M  | F  | Total |
|-------------|----|----|-------|
| 10-13       | 384| 311| 695   |
| %           | 74.6| 69.9| 72.3 |
| 14-16       | 131| 134| 265   |
| %           | 0.3| 30.1| 27.7 |
| Total       | 515| 445| 960   |
| %           | 100.0| 100.0| 100.0|

Table no. 2: Different grades of hypertension

| Blood Pressure                                      | No. | %  |
|-----------------------------------------------------|-----|----|
| Systolic BP (≥ 90th to 95th percentile)              | 12  | 1.3|
| Systolic BP (≥ 95th to 99th percentile)              | 18  | 1.9|
| Systolic BP (≥ 99th percentile)                     | 24  | 2.5|
| Diastolic BP (≥ 90th to 95th percentile)             | 15  | 1.6|
| Diastolic BP (≥ 95th to 99th percentile)             | 20  | 2.1|
| Diastolic BP (≥ 99th percentile)                     | 17  | 1.8|
AUTHORS:
1. Rakesh Mishra
2. Astha Tiwari
3. Shweta Anand
4. Roshan Chanchlani

PARTICULARS OF CONTRIBUTORS:
1. Associate Professor, Department of Paediatrics, Chirayu Medical College and Hospital, Bhopal.
2. Assistant Professor, Department of Paediatrics, Chirayu Medical College and Hospital, Bhopal.
3. Associate Professor, Department of Paediatrics, Chirayu Medical College and Hospital, Bhopal.
4. Associate Professor, Department of Surgery, Chirayu Medical College and Hospital, Bhopal.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Roshan Chanchlani,
#1/6-Idgah Kothi,
Doctors Enclave,
Near Filter Plant, Idgah Hills,
Bhopal-462 001, M. P.
Email: roshanchanchlani@gmail.com

Date of Submission: 26/05/2014.
Date of Peer Review: 27/05/2014.
Date of Acceptance: 31/05/2014.
Date of Publishing: 06/06/2014.