EVALUATION OF BLOOD PRESSURE REACTIVITY IN RURAL SCHOOL GOING CHILDREN

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ABSTRACT

Background & objectives: *Arterial blood pressure is an important physiological parameter in epidemiology of cardiovascular disease. Hypertension has been reported to be generally associated with sympathetic over activity. In the study of hypertension, several authors have made use of a technique, known as Cold Presser Test. It was designed to measure the reactivity of blood pressure to a standard stimulus. Thus this study was undertaken to evaluate the response to the standard stimulus in the school going children.*

Methods: *The study was conducted on healthy school children between the age group of 6.5 years to 11.5 years. The blood pressure was recorded using the standard auscultatory technique and cold pressure test was done as described by Hines & Brown (1932). Individuals were categorized into two groups, depending on their reactivity to cold pressure test as norm reactors (NR) and hyper-reactors (HR).*

Results: *The significant increase ($p<0.05$) in post-test SBP and DBP was observed in the subjects with the ages of 8.5 years and above. The magnitude of increase in SBP and DBP is in inverse proportion to the age of the subjects. The percentage of hyper- reactors showed an increasing trend with the age.*

Interpretation & conclusions: *As the age has inverse proportion the increase of blood pressure the younger age group children need more caring approach both in school and home and as the percentage of hyper-reactors increase with age and class level this indicates the role of academic level influencing the blood pressure reactivity.*

Key words: *Blood pressure, children, cold pressure test*

INTRODUCTION

Arterial blood pressure, an important physiological parameter has great etiological significance in epidemiology of cardiovascular disease due to its association with age, height, weight, diet, stress, socio-economic status etc.(1) Familial aggregation of hypertension documents an important genetic component. Concordance of blood pressure is greater within families than in unrelated individuals, greater between monozygotic than between dizygotic twins and greater between biological than between adoptive siblings living in same household. About 70% of familial aggregation of blood pressure is attributed to shared genes rather than shared environment.(2) Hypertension has been reported to be generally associated with sympathetic over activity.(3) But the sympathetic response of certain individuals from both normotensive and hypertensive population have been reported to be more pronounced.(4) Previous studies of family history of patients with hypertension have shown a hereditary factor in 76-86% of cases. Essential hypertension is a hereditary disease conveyed as a Mendelian dominant with a rate of expression of more than 90%.(5) In the study of hypertension, several authors have made use of a technique, known as Cold pressure Test. It was introduced by Hines and Brown in 1932. The test is based on the fact that immersion of hand in ice cold water causes a rise of blood pressure. It was designed to measure the reactivity of blood pressure to a standard stimulus.(6) Thus this study was undertaken to evaluate the response to the standard stimulus in the school going children.

MATERIALS AND METHODS

The study was conducted in February 2014 on healthy school children between the age group of 6.5 years to 11.5 years randomly selected 30 students from each class (class 2nd to class 6th) after obtaining the informed written consent of

the parents/ guardians. The children having the family history of hypertension were not included in the study. The blood pressure was recorded using the standard auscultatory technique and cold pressure test was done as described by Hines & Brown (1932). Individuals were categorized into two groups, depending on their reactivity to cold pressure test as norm reactors (NR) and hyper-reactors (HR). The subjects who had registered a rise of more than 22 mmHg of systolic blood pressure (SBP) and 18 mmHg of diastolic blood pressure (DBP) were grouped as HR. Those, whose both SBP and DBP were not raised more than 22 mmHg and 18 mmHg respectively were grouped as NR and the data obtained was analysed statistically using student's t- test.

The study was approved by the institution ethical committee for research on humans.

RESULTS

The significant increase ($p<0.05$) in post-test SBP and DBP was observed in the subjects with the ages of 8.5 years and above (Table I). The magnitude of increase in SBP and DBP is in inverse proportion to the age of the subjects (Fig. I & II). The percentage of hyper- reactors showed an increasing trend with the age (Fig. III).

DISCUSSION

The increased SBP and DBP as observed in the study as shown in table- I was due to the cold pressure response which is an indicator of sympathetic activity after cold stress. A healthy response to a cold pressure test (CPT) is sympathetic activation which in turn causes an increase of blood pressure. Clinically the test evaluates autonomic function[9-11].Studies have reinforced cold pressure test as a tool to predict the chances of a person becoming hypertensive later on in life and [12]. The association between hypertension and sympathetic over activation has been established[13-15]. As abnormal autonomic response plays a role in cardiac morbidity as shown by various studies, in the later life[7]. Sympathetic over activity plays a significant role in development of neurogenic hypertension[8].Thus, the parents of the individuals who turn out to be the hyper-reactors in this study should be counselled for proper parenting.

The systolic blood pressure rise was more than that of the diastolic pressure rise as shown in figure-I and II. Systolic blood pressure is influenced by cardiac contractility which increases by sympathetic innervations. It's an indicator of work load on the heart and is characterized by a lot of fluctuations. Diastolic blood pressure on the other hand undergoes less degree of fluctuations and is of greater prognostic importance than the systolic blood pressure. Arterial blood pressure is an important factor in epidemiology of cardiovascular disease due to its association with anthropometric and demographic causes[16-18].

According to Kasagi, Germano et al, Lambert and Schlaich blood pressure responses to cold pressure test are probably affected by different factors related to participant's emotional state and coping style[16-18], this may be the reason for inverse proportion of age to increase in SBP and DBP as shown in figure- III.

Thus by this study it can be concluded that the parents of the individuals who turn out to be hyper- reactors should be counselled for proper parenting so that these children can be prevented from developing hypertension in later life. As the age has inverse relation with the increase of blood pressure thus the younger children needs more tender approach and as the percentage of hyper- reactors increase with the age this may have the contribution of the increasing level of academic pressure on children.

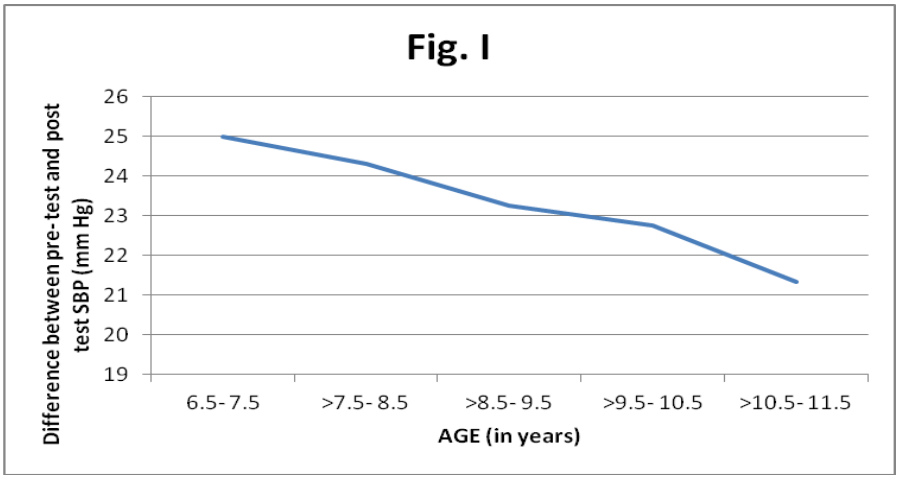
Limitations of the Study:

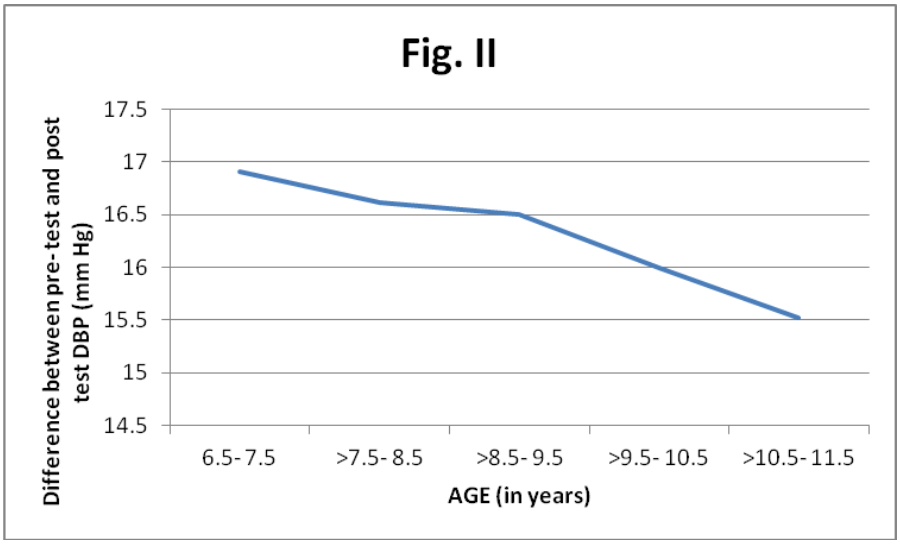
i. Our study could not control various other factors like anxiety which influence the arterial blood pressure.
ii. The sample size was relatively small.
iii. Only children between 6.5 to 11.5 years were studied.

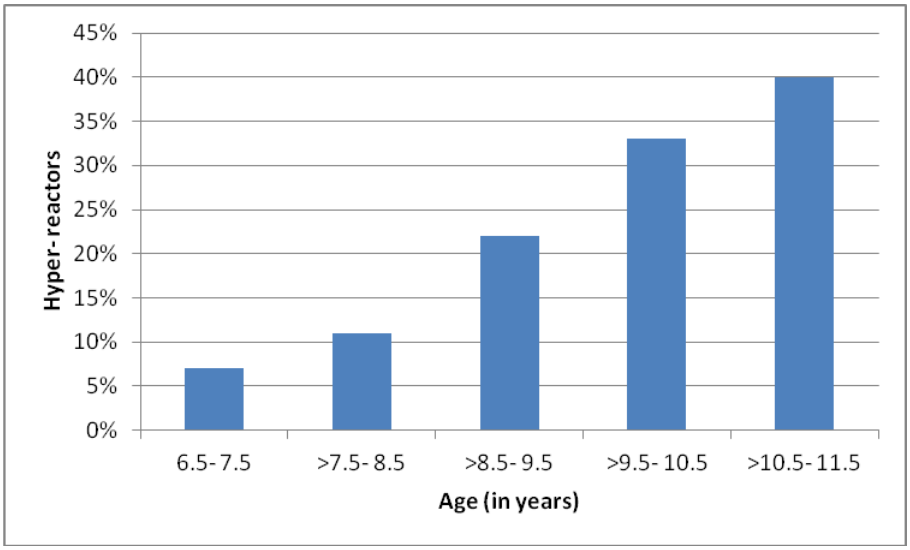
Table I

AGE (IN YEARS)	6.5- 7.5	>7.5- 8.5	>8.5- 9.5	>9.5- 10.5	>10.5- 11.5
CLASS	CLASS 2	CLASS 3	CLASS 4	CLASS 5	CLASS 6
PRE TEST					
PULSE (per minute)	85.61 ± 9.36	81.57 ± 9.22	93.75 ± 10.11	79.25 ± 12.91	86.28 ± 8.81
SBP (mm Hg)	109.80 ± 10.35	113.38 ± 11.58	105.50 ± 8.05	102.25 ± 8.58	111.42 ± 13.35
DBP (mm Hg)	77.09 ± 10.43	75.23 ± 8.54	68.75 ± 6.92	76.75 ± 8.48	72.19 ± 11.77
POST TEST					
PULSE (per minute)	101.80 ± 9.68	95.84 ± 9.03	109.75 ± 9.82	95.25 ± 10.52	103.80 ± 10.05
SBP (mm Hg)	134.80 ± 9.68	137.69 ± 12.82	128.75*± 8.48	125.00*± 10.19	132.76*± 11.14
DBP (mm Hg)	94.00 ± 9.99	91.84 ± 9.37	85.25*± 7.24	92.75*± 6.67	87.71* ± 11.80

*P< 0.05, student's t- test.







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REFERENCES

1. Guyton AC, Hall JE. Blood Pressure: Textbook of Medical Physiology. 10th ed. Harcourt Brace And Company; 2003. p. 205-6.
2. Goldman L, Ausiello D. Blood pressure: Cecil textbook of Medicine. 22nd ed. An Imprint of Elsevier,Philadelphia; 2004. p.346.
3. De Quattro V, Feng M. The sympathetic nervous system: the muse of primary hypertension. *J Hum Hypertens* 2002;16 suppl 1: S64-9.
4. Hines EA, Jr. Significance of vascular hyperreaction as measured by cold pressor test. *Amer Heart J* 1940;19:408-16.
5. Platt R. Heredity in hypertension. *Quarterly J of Medicine* 1947;16:111-33.
6. Hines EA, Brown GE. Cold pressor test for measuring the reactibility of blood pressure. *AmericanHeart J* 1936;11:1-9.
7. Pramanik T., Regmi P. and Shrestha P., Detection of individuals prone to develop hypertension in their future life, *Nepal Med Coll J.*, 2008 10, 35–37
8. Schneider G.M., Jacobs D.W., Gevirtz R.N., O'Connor D.T., Cardiovascular haemodynamic response to repeated mental stress in normotensive subjects at genetic risk of hypertension: evidence of enhanced reactivity, blunted adaptation and delayed recovery, *J Human Hypertens*, 2003, 17, 829–840
9. Wood D.L., Sheps S.G., Eleback L.R. and Schirger A., Cold pressor test as a predictor of hypertension, *Hypertension*, 1984, 6, 301–306
10. Briggs J.F. and Getting H., Vasomotor response of normal and hypertensive individuals to thermal stimulus (cold), *Minn Med.*, 1981, 16, 481–486
11. Hines E.A., Jr. Significance of Vascular Hyper reaction as measured by Cold-Pressor test, *American Heart J.*, 1940, 19,408–416
12. Kelsey R.M., Patterson S.M., Barnard M. and Alpert B.S., Consistency of hemodynamic responses to cold stress in adolescents, *Hypertension*, 2000, 36, 1013–1017
13. Jacques de Champlain and Marie Reine Van Amerigen, Regulation of Blood Pressure by Sympathetic Nerve fibres and Adrenal Medulla in Normotensive and Hypertensive Rats, *Circulation Research*, 1972, 31, 617–628
14. Mancia G., Di Rienzo M., Giannattasio C., Parati G. andGrassi G., Early and late sympathetic activation in hypertension, *Scand Cardiovasc J Suppl.*,1998, 47, 9–14
15. DeQuattro V. and Feng M., The Sympathetic nervous system: the muse of primary hypertension, *J Hum Hypertens*, March 2002, 16 Suppl 1, S64–S69

16. Verma V., Singh S.K. and Ghosh S., Identification of susceptibility to hypertension by the cold pressor test, *Indian J Physiol Pharmacol*, 2005, 49(1), 119-20
17. Kasagi F., Akahoshi M. and Shimaoka K., Relation between cold pressor test and development of hypertension based on 28 year follow up, *Hypertension*, 1995, 25, 71-6
18. Germano G., Lintas F., Truini A., Raggazzo M., Lannetti G.D. and Sperduti L et al., Blood pressure, *High Blood Pressure and Cardiovascular Prevention*, 2003, 2(10), 87-90

CORRIGENDUM

The list of authors for the article "**EVALUATION OF BLOOD PRESSURE REACTIVITY IN RURAL SCHOOL GOING CHILDREN"** published in Indian Journal of Clinical Anatomy and Physiology, Vol 2, Issue 1, March 2015, may be corrected and read as under in Hardcopy-

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