

## Comparative study of cold pressor test between blind children and normal sighted children in the age group of 10- 17 years

Ashwini R. Doyizode<sup>1,\*</sup>, Rajashekar RK<sup>2</sup>

<sup>1</sup>Assistant Professor, SDMCMS & H, Dharwad, Karnataka, <sup>2</sup>Professor & HOD, Dept. of Physiology, Al-Azhar Medical College & Super Speciality Hospital, Thodupuzha, Kerala

**\*Corresponding Author:**

Email: drashwinilokre@gmail.com

### Abstract

**Introduction:** Childhood blindness has a great impact on development, education, and quality of life, leading to stress causing increased autonomic discharge exhibiting elevated levels of anxiety, depression.

**Aim:** To compare the effects of Cold pressor test in blind and normal sighted children.

Comparison of effect of cold pressor test in hyper reactors and normoreactors.

**Materials and Method:** Blind and normal sighted children thirty each, of 10 to 17 years were selected, consent was taken and cold pressor test was performed.

**Results:** Comparison of supine SBP to maximum SBP during CPT; maximum rise in DBP among cases and controls; among hyperreactors and normoreactors, maximum SBP during CPT; maximum rise in SBP and DBP showed significant difference.

**Conclusion:** Present study may give an idea about the blind children who are likely to develop hypertension in future helping in early diagnosis.

**Keywords:** Blindness, Hypertension, Stress.

**Received:** 26<sup>th</sup> April, 2017

**Accepted:** 31<sup>st</sup> July, 2017

### Introduction

Blindness can have a negative impact on a person's physical and mental health. Many factors such as economic, social and cultural repercussion of blindness can alter the person's perception of self-worth. They may have poor family support and are socially alienated. The suffering is more especially in those with poor economic background. Hence there is a well-established link between blindness and physical/mental health. Childhood blindness has a great impact on child's development, education, future, work opportunities and quality of life thus affecting the life of the child throughout. The blind suffers from stress which increases autonomic discharge.

These factors induce physiological alterations in the body, leading higher rates of breathing, increased heart rate, diastolic blood pressure which could lead to various complications like cardiovascular diseases, hypertension, diabetes mellitus etc., Blind people exhibited clinical elevations of anxiety, depression, phobic anxiety, and stress than normal sighted subjects.<sup>(1)</sup> They also felt higher stress levels in their interactions with normal sighted people and hence vision contributes to the personal factors affecting daily stress in these people.<sup>(2)</sup>

Studies showed that blind children are less fit than the sighted peers<sup>(3)</sup> leading to higher resting heart rate and blood pressure to the normal sighted children. Thus chronic life stress increases sympathetic nervous system activation leading to cardiovascular diseases and hypertension.<sup>(4,5)</sup>

There is a need to study the cardiovascular autonomic function in blind children to find out the hyper reactors who are likely to develop hypertension in their future lives. No study has been done on autonomic functions in blind children hence the present study was undertaken.

### Objective of the study

To compare the effects of Cold pressor test in blind children and normal sighted children of the same age group.

**Source of data:** Institutional ethical clearance was obtained. Thirty blind children for The Maheshwari School for Blind, in the age group of 10 to 17 years and thirty normal sighted children of the same age group from the regular government schools in Belgaum were selected. Informed expressed written consent were taken from the parents/guardians and head of the schools of the blind children and normal sighted children. This is a cross sectional study.

**Inclusion criteria:** Healthy blind and normal children.

**Exclusion criteria:** Known cases of hypertension, diabetes mellitus, asthma

### Materials and Method

Several authors have made use of Cold Pressor Test. It was introduced by Hines and Brown in 1932. The test is based on that 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.<sup>(6)</sup>

The subjects were explained about the procedure and allowed to rest in supine posture for at least 20 minutes. Baseline blood pressure was measured in the right upper arm. The left hand was immersed to just above the wrist in cold water (3° to 5° C) for 1 minute; blood pressures are measured at 30, 60, and 120 seconds after immersion.

## Results

The obtained data were tabulated and the results were interpreted by using student T test for analysis of the following parameters -

Comparison between:

Supine SBP among cases and controls.

Maximum SBP among cases and controls.

Maximum rise in SBP and DBP among cases and controls.

Supine SBP and maximum SBP among cases and controls.

Supine SBP among hyperreactors and normoreactors.

Maximum SBP among hyperreactors and normoreactors.

Maximum rise in SBP and DBP among hyperreactors and normoreactors.

**Table 1: Comparison of SBP and DBP between blind children and normal sighted children**

Parameters	Mean±SE		P value
	Cases (n=30)	Controls (n=30)	
Supine SBP	106.4± 1.51	104.23± 1.78	>0.05
Maximum SBP during CPT	121.67± 1.95	117.47± 2.14	>0.05
Maximum rise in SBP	15.8± 1.61	13.57± 1.35	>0.05
Maximum rise in DBP	23.33± 1.71	17.53± 1.32	<0.05
Supine SBP	106.4± 1.51	104.23± 1.78	<0.01
Maximum SBP during CPT	121.67± 1.95	117.47± 2.14	<0.01

Cases -Blind children

Controls - Normal sighted children

n -Number of cases

SBP - Systolic blood pressure

DBP - Diastolic blood pressure

CPT - Cold pressor test

SE - Standard error

The mean± SE of supine SBP; Maximum SBP during CPT; Maximum rise in SBP among cases and controls were statistically insignificant.

Maximum rise of DBP among controls was 17.53± 1.32 and among cases was 23.33± 1.71 and was statistically significant.

The mean± SE of supine SBP and maximum SBP during CPT among cases were 106.4± 1.51 and 121.67± 1.95 respectively, showing high statistical significance.(p value <0.01)

The mean± SE of supine SBP and maximum SBP during CPT among controls were 104.23± 1.78 and 117.47± 2.14 respectively, and was statistically significant.

Children were regrouped as hyperreactors (criteria of a rise of more than 22 mm Hg systolic and 18 mmHg diastolic blood pressure, respectively) and normoreactors who did not show that much of rise in SBP and DBP (Table 2)

Out of 60 children, 13 children were found to be hyperreactors and 47 children were normoreactors. Among the cases, 9 blind children were hyperreactors and 21 were normoreactors and among the controls 4 children were hyperreactors and 26 were normoreactors.

**Table 2: Comparison of SBP and DBP between hyperreactors and normoreactors**

Parameters	Mean± SE		P value
	Hyperreactors (n=13)	Normoreactors (n=47)	
Supine SBP	104.46± 3.15	105.55± 1.23	>0.05
Maximum SBP during CPT	130.77± 3.24	116.47± 1.33	<0.01
Maximum rise in SBP	26.31± 0.84	11.47± 0.85	<0.001
Maximum rise in DBP	24.31± 1.89	19.36± 1.32	<0.05

Supine SBP among hyperreactors was 104.46± 3.15 and that of normoreactors was 105.55± 1.23, was statistically insignificant.

Maximum SBP during CPT among hyperreactors and normoreactors were 130.77± 3.24 and 116.47± 1.33 respectively, and was of high significance.

Maximum rise in SBP and Maximum rise in DBP among hyperreactors and normoreactors were similarly significant (Table 2)

### Discussion

CPT was introduced as a tool to measure cardiovascular reactivity, blood pressure changes in response to stress. The stimulus in CPT involves a cold and a pain component. Both these components induce a thermoregulatory reflex and global sympathetic activation, producing many physiological responses such as vasoconstriction, increased blood pressure, heart rate, total vascular resistance and muscle sympathetic nerve activity.<sup>(7,8,9)</sup>

Normal individuals who showed an increased blood pressure reactivity response to the CPT had developed a high ambulatory blood pressure, 3 years later.<sup>(10)</sup> Also studies have shown that vascular hyper reactivity to external applied stimulus preceded the development of fixed hypertension.<sup>(6)</sup>

In this context the present study was done to compare the effects of cold pressor test among the blind children and normal children. Among the parameters studied in cases and controls, the comparison of supine SBP to maximum SBP during CPT; maximum rise in DBP; and among hyperreactors and normoreactors, maximum SBP during CPT; maximum rise in SBP and DBP showed significant difference. These results may be due to sympathetic hyperactivity.<sup>(6)</sup> Similar results were obtained in a study done among normal sighted siblings of hypertensives and normotensives where siblings of hypertensives showed higher rise in SBP and DBPs.<sup>(11)</sup>

Also among the cases and controls, the supine SBP; maximum SBP during CPT; and maximum rise in SBP, though showed increased response, they were statistically insignificant.

Comparison of the supine SBP and hyperreactors and normoreactors showed insignificant result. Similar results were obtained in some studies which showed that a significant proportion of variation in blood pressure response to the CPT is independent of baseline.<sup>(12)</sup>

The school from which the cases were selected had many extracurricular activities for the blind children so that they could engage themselves and are partially depressed, this factor could have acted as a stress buster and could be the reason for the insignificant results.

### Conclusion

The present study may give an idea about the blind children who are likely to develop hypertension in future so as to make an early diagnosis. If cold pressor test is repeated among these children the hyperreactors would have come back to normal or the normoreactors may show hyperreactivity depending on the stress factors in the future.

### Limitations

The present study can be improved by including more number of cases as there is a huge population which is economically, emotionally and socially deprived and also by including serum cortisol levels to correlate with study results.

### References

1. Cox DJ, Keirman BD, Schroeder DB, Cowley M. Psychological sequelae of visual loss in diabetes. *Diabetes Educ.* 1998;24(4):481-4.
2. Matsunaka K. An investigation of personal factors on daily stress of people with visually impairment. *Shinrigaku Kenkyu.* 2002;73(4):34-5.
3. Hopkins WG, Gaete H, Thomas HC, Hill PM. Physical fitness of blind and sighted children. *Eur J Appl Physiol.* 1987; 56(1): 69-73.
4. Rozanski A, Blumenthal JA, Kaplan J. Impact of psychological factors on the pathogenesis of cardiovascular disease and implications for therapy. *Circulation.* 1999;99(16):2192-217.
5. Lucini D, Norbiato G, Clerici M, Pagani M. Hemodynamic and autonomic adjustments to real stress conditions in humans. *Hypertension.* 2002;39(1):184-4.
6. Hines EA, Brown GE. Cold pressor test for measuring the reactivity of blood pressure. *American Heart J* 1936;11:1-9.
7. Greene MA, Boltax AJ, Lustig GA, Rogow E. Circulatory dynamics during the cold pressor test. *Am J Cardiol.* 1965 Jul;16:54-60.
8. Peckerman A, Hurwitz BE, Saab PG, Llabre MM, McCabe PM, Schneiderman N. Stimulus dimensions of the cold pressor test and the associated patterns of cardiovascular response. *Psychophysiology.* 1994 May;31(3):282-90.
9. Lovallo W. The cold pressor test and autonomic function: a review and integration. *Psychophysiology.* 1975 May;12(3):268-82.
10. Knox SS, Hausdorff J, Markovitz JH; Coronary Artery Risk Development in Young Adults Study. Reactivity as a predictor of subsequent blood pressure: racial differences in the Coronary Artery Risk Development in Young Adults (CARDIA) Study. *Hypertension.* 2002 Dec;40(6):914-9.
11. Rajashekar RK, Niveditha Y, Sumitabha G. Blood pressor responses to cold pressor test in siblings of hypertension. *Indian J Physiol Pharmacol* 2003;47(4):453-8.
12. Roy-Gagnon MH, Weir MR, Sorkin JD, Ryan KA, Sack PA, Hines S, Bielak LF, Peyser PA, Post W, Mitchell BD, Shuldiner AR, Douglas JA. Genetic influences on blood pressure response to the cold pressor test: results from the Heredity and Phenotype Intervention Heart Study. *J Hypertens.* 2008 Apr;26(4):729-36. doi: 10.1097/HJH.0b013e328282f524b4.