

## BLOOD PRESSURE RESPONSE TO COLD PRESSOR TEST AMONG CHILDREN OF HYPERTENSIVE AND NORMOTENSIVE PARENTS

Tania Cheerakathottathil Philip<sup>1</sup>, Bindu Pullattu Chacko<sup>2</sup>, Bindumol Kavungathodi<sup>3</sup>, Vinaykumar Desabandhu<sup>4</sup>

<sup>1</sup>Postgraduate Student, Government College of Nursing, Kozhikode, Kerala.

<sup>2</sup>Assistant Professor, Government College of Nursing, Kozhikode, Kerala.

<sup>3</sup>Assistant Professor, Government College of Nursing, Kozhikode, Kerala.

<sup>4</sup>Additional Professor, Department of Cardiology, Government College of Nursing, Kozhikode, Kerala.

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### ABSTRACT

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#### BACKGROUND

Hypertension is one of the leading causes of premature death worldwide and the problem is growing. It is a risk factor for coronary heart disease and the single most important risk factor for stroke. Inheritance of hypertension, the genetic contribution is reported to range from 30-50%.<sup>1</sup> Screening, detection and early treatment of hypertension can significantly reduce the complications and health care cost. Cold pressor test is a provocative test considered to be a potentially useful indicator of future hypertension.

The aim of the study is to compare the blood pressure response to cold pressor test between children of hypertensive and normotensive parents.

#### MATERIALS AND METHODS

Present study is a non-experimental descriptive study conducted among 65 children of hypertensive and normotensive parents each (total 130 subjects) in the age group 18-30 years residing at Mavoor Panchayath, Kozhikode, Kerala from 20-02-2015 to 03-05-2015. Socio demographic data, health related habits, BMI and blood pressure response to the cold pressor test of the subjects were assessed. The data was analysed using SPSS software 18<sup>th</sup> version.

#### RESULTS

Among the 65 children of hypertensive and normotensive parents each, more than half (56.9% and 55.4% respectively) were not following any regular exercise pattern. 9.2% of children of hypertensive parents & 6.2% of children of normotensive parents were smokers. 31% of children of hypertensive parents & 4.6% of normotensive parents were obese (BMI >30). Among the children of hypertensive parents, in 17% both the parents were hypertensive. The mean change in the Systolic Blood Pressure (SBP) to cold Pressor test among children of hypertensive parents was higher (9.5 with SD 12.3) than the mean change among children of normotensive parents (6.7 with SD 9.6) The mean change in Diastolic Blood Pressure (DBP) to cold pressor test among children of hypertensive parents was higher (10.4 with SD 9.3) than that of children of normotensive parents (8.7 with SD 7.4). But the difference was not statistically significant (P>0.05).

#### CONCLUSION

The present study suggests that the blood pressure response to cold pressor test among children of hypertensive parents is numerically higher than the same among normotensive parents. But the difference is not statistically significant.

#### KEYWORDS

Blood Pressure Response, Cold Pressor Test, Systolic Blood Pressure, Diastolic Blood Pressure.

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#### BACKGROUND

Hypertension is a silent, invisible killer in which arteries have persistently elevated blood pressure at or above 140/90 mmHg. Essential Hypertension is a complex trial resulting

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*Corresponding Author:*

*Bindu Pullattu Chacko,*

*Assistant Professor,*

*Government College of Nursing,*

*Kozhikode, Kerala.*

*E-mail: pcbindu2010@gmail.com*

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from the interactions of multiple genetic and environmental determinants. It is a modern day's epidemic becoming a public health emergency worldwide.<sup>2</sup> It is matters of concern because of patients unaware of their disease are at equal risk for development of complications.<sup>3</sup>

WHO rates hypertension as a risk factor for coronary heart disease and single most important risk factor for stroke. It causes about 50% of ischemic stroke and increases the risk of haemorrhagic stroke.<sup>4</sup>

Primary prevention of hypertension provides an opportunity to interrupt and prevent continuing costly cycle of managing hypertension and its complications.<sup>5</sup>



Screening is to identify individuals in whom sustained hypertension might develop. Provocative testing is based on the premise that an exaggerated response of blood pressure to some external stimuli is indicative of future hypertension.<sup>6</sup>

In an age when patients are increasingly educating themselves as to the side effects of drugs and possible alternative approaches, a growing number may be willing to institute necessary changes to contribute to their health.

Hiner and Brown proposed that a hyper reactive response of blood pressure to an externally applied cold stimulus is an inherited trait and that a period of vascular hyperactivity preceded the development of fixed hypertension.

A prospective longitudinal 45yrs study by AHA using cold pressor test revealed that 71% of hyperreactors and 19% of normo reactors developed hypertension in their future life.

Identifying the genetic predisposition at an early age followed by life style modifications can delay the occurrence or reduce the complications of hypertension. Cold pressor test is a simple, cost effective and easy to perform test which helps to identify the inherited risk for hypertension and to adapt modifications to environmental & life style risks.

### **Aim of the Study**

The aim of the study was to assess the blood pressure response to cold pressor test among children of normotensive and hypertensive parents and to compare their response.

### **MATERIALS AND METHODS**

The study was conducted among 65 children of normotensive and hypertensive parents each (total 130 subjects) in the age group 18-30 yrs. residing at Mavoor Panchayat, Kozhikode, Kerala. Data collection period was from 20/2/15 to 03/05/15.

### **Patients' Selection**

Non-hypertensive children of normotensive and hypertensive parents were included in the study. The age group was 18-30yrs. Those diagnosed with any chronic medical diseases and having history of cold intolerance were excluded. Willingness to participate in the study was ensured & informed consent was obtained.

### **Procedure**

After ensuring the blood pressure status of the parents the children (both male & female) were enrolled in the study based on sampling criteria. The socio personal & clinical data of the subjects were collected through interview.

After ensuring a rest period of 5mts the participants were seated comfortably and base line blood pressure was assessed on the right hand using standardized digital blood pressure monitor and the deflated BP cuff was retained there

(before checking baseline BP it was ensured that the individual is refrained from ingestion of caffeine and smoking 30mts preceding the measurement).

The participants were then asked to immerse their left hand up to wrist in the cold water maintained at a temperature 4-6°C. Blood pressure was measured after one minute of cold water immersion on the right hand. Left hand was removed from cold water and wiped with a towel. After removing the BP cuff the pressure response was computed and informed to the participants. A positive response is an increase of 22 mmHg or more in the systolic BP or/and an increase of 18mm of Hg or more in diastolic BP in comparison to baseline BP.

### **RESULTS**

130 children of normotensive and hypertensive parents (65 in each group) were studied. They were in the age group 18-30 yrs. 46.8% of the study participants were males and 53.2% were females. Most of the participants were following non-vegetarian diet pattern (100% of children of hypertensive parents & 98.5% of normotensive parents). Majority of the participants were not following any dietary modifications and among those follow modifications, they were controlling sweets, fried fatty foods & salt in their diet. More than half of the participants in both the groups (56.9% children of hypertensive parents and 55.4% children of normotensive parents) were not doing any regular exercise. 9.2% of children of hypertensive parents and 6-2% children of normotensive parents were smokers. Obesity (BMI >30) was observed among 3.1% of children of hypertensive and 4.6% children of normotensive parents. 47.7% children of hypertensive parents and 46.2% children of normotensive parents has a SBP 120-139 mmHg (earlier termed as prehypertension, currently elevated BP and/stage 1 hypertension). Similarly 30.8% and 23.1% children of hypertensive and normotensive parents respectively had a DBP 80-89 mmHg (earlier prehypertension, currently stage I hypertension).

- 27.7% children of hypertensive and 20% children of normotensive parents had positive cold pressor response. Among the positive cold pressor respondents 50% in hypertensive parents' group and 15.4% in normotensive parents group showed positive response both in SBP and DBP.
- The mean change in SBP to cold pressor test was higher among children of hypertensive parents (9.5 mmHg with SD 12.3 mmHg) than that among children of normotensive parents (6.7 mmHg with SD 9.6). In the same way, in DBP the response was found more among children of hypertensive parents (10.4 mmHg with SD 9.3) than the same among children of normotensive parents (8.7 with SD 7.4). But the difference was not statistically significant (P >0.05).

Variables	Children of Hypertensive Parents (N = 65)		Children of Normotensive Parents (N = 65)	
	f	%	f	%
<b>Age in Years</b>				
18-22	27	41.5	40	61.5
23-26	18	27.7	18	27.7
27-30	20	30.8	7	10.8
<b>Gender</b>				
Male	32	49.2	30	44.6
Female	33	50.8	35	55.4
<b>Food Habits</b>				
veg			1	1.5
Non-veg	65	100	64	98.5
<b>Smoking Habit</b>	6	9.2	4	6.2
<b>Practice of Regular Exercise</b>	28	43.1	29	44.6
<b>Obesity (BMI &gt;30)</b>	2	3.1	3	4.6
<b>SBP &lt;120 mmHg</b>	34	52.3	35	53.8
<b>SBP &lt;120 – 139 mmHg</b>	31	47.7	30	46.2
<b>DBP &lt;80 mmHg</b>	45	69.2	50	76.9
<b>DBP 80-89 mmHg</b>	20	30.8	15	23.1
<b>Positive Cold Pressor Response</b>	18	27.7	13	20

**Table 1. Main Characteristics of Study Population**

## DISCUSSION

Blood pressure, if remains high for a long time, can damage vital organs of our body leading to complications. Focus should be on primary prevention which necessitate screening high risk individuals.

In the present study 76.2% of the participants were normoreactors and 23.8% of them were hyper reactors. This is similar to the findings of a study conducted among Indian medical students in the age group 17-30 yrs. which showed that 83% of them were normoreactors and 16.9% were hyper reactors to cold pressor test.<sup>7</sup>

The present study revealed that the mean change in SBP to cold pressor test was higher among children of hypertensive parents (9.5 mmHg with SD 12.3 mmHg) than that among children of normotensive parents (6.7 mmHg with SD 9.6). DBP also showed an increased response to cold pressor test among children of hypertensive parents (10.4 mmHg with SD 9.3) than the same among children of normotensive parents (8.7 with SD 7.4).

In the present study there was no statistically significant difference ( $p=0.303$ ) in the cold pressor response between children of hypertensive and normotensive parents. This finding is inconsistent with the findings of the study conducted among 100 children of hypertensives and normotensives in the age of 16-20 yrs, which showed a highly significant cold pressor response in BP among children of hypertensive parents.<sup>8</sup>

## CONCLUSION

The present study findings demonstrated that the response to cold pressor test (a predictor of future hypertension) was numerically higher among children of hypertensive parents. But the difference was not statistically significant.

## Limitations of the Study

Limitations of our study were small sample size and it's a single setting observational study. Prospective cohort follow

up is required to assess the blood pressure status of the participants so as to evaluate the predictive ability of the cold pressor test.

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