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COMPARISON OF COLD PRESSOR TEST IN CHILDREN OF HYPERTENSIVE AND NON HYPERTENSIVE PARENTS

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ABSTRACT:

INTRODUCTION: Early diagnosis of hypertension risk may enable a person to live a healthier lifestyle. Subjects with predisposing characteristics for hypertension had greater and longer-lasting blood pressure responses to stress. The Present study was conducted to examine the blood pressure response to cold pressor test in the medical students of hypertensive parents and compare it with the controls of normotensive parents

MATERIALS AND METHOD*:* 100 I MBBS students in the age group of 17-21 years participated in the study. students were divided into 2 groups; Group I-normotensive group (50) with no family h/o hypertension and Group II-hypertensive group (50) with family h/o hypertension Before the test, subjects were allowed to rest for 10 minutes in a quiet room to reduce the anxiety. Basal blood pressure of all the subjects was measured. Cold pressor test was done in both the study group and control groups. After recording basal blood pressure, subjects were asked to dip left arm in the cold water (temp at 2-4^0 C) for 2 minutes and blood pressure was recorded from the right arm. Blood pressure was again recorded 5 minutes after hand was taken out from the cold water. statistical analysis was done using SPSS software version 21.

RESULTS: On comparison of means of systolic blood pressure and diastolic blood pressure among both the groups, it was observed that the value of systolic blood pressure & diastolic blood pressure was higher in hypertensive group as compared to normotensive group. The rise in systolic and diastolic blood pressure during cold pressor test and 5 min after CPT was significantly higher in children of hypertensive group when compared to the children of normotensives. Diastolic blood pressure in children of hypertensive group did not return to normal levels even 5 minutes after withdrawal of the stimulus

CONCLUSION: children of hypertensive parents who exhibit increased and especially extended response to diastolic blood pressure due to sympathetic stimulation via the cold pressor test may be at a high risk of developing hypertension early in life. Early detection of hypertension in the children of hypertensive parents is of prime importance as lifestyle modification can be started at an early age and cardiovascular risk can be avoided. Routine screening must be performed to detect asymptomatic hypertension amongst adolescents with the family history of hypertension.

KEYWORDS: Cold pressor test, Systolic Hyper reactors, Diastolic hyper reactors.

INTRODUCTION:

Hypertension, a severe health concern in today's society, endangers all of mankind. Essential hypertension is the most common kind of hypertension. [1] Early detection of hypertension risk can help an individual live a healthier lifestyle by avoiding alcoholic beverages, smoking, eating too much fat, and practicing yogic exercise, [2] moderate aerobic exercise, [3] mental relaxation, [4] and so on. As a result, it will undoubtedly be beneficial if a person is made aware that he or she may have hypertension long before the problem reveals itself.

The cardiovascular reaction to stress may be deleterious in neurogenic hypertension. According to study, those at high risk of hypertension may have a more severe stress-induced cardiovascular response at a younger age. [5] The sympathetic nervous system is critical for the development of essential hypertension. Subjects with a positive history of familial hypertension, a high resting heart rate, or a temporary rise in arterial hypertension have been shown to have hyper responsive blood pressure to stress stimuli, which is mediated by sympathetic nervous system over activity. [6]

When a stressor activates the sympathetic nervous system, heart rate and blood pressure rise; however, when the stressor is eliminated, heart rate and blood pressure typically return to normal levels within a short period of time [7]. Over activity of the sympathetic nervous system contributes to the pathogenesis of neurogenic hypertension in young persons [8]. If a patient's cardiovascular system is extremely sensitive to a stressor and recovers slowly in its absence, he or she is at high risk of developing hypertension in the future [9].

The Present study was conducted to examine the blood pressure response to cold pressor test in the medical students of hypertensive parents and compare it with the controls of normotensive parents.

MATERIALS AND METHODS:

Over the course of three months, the current cross-sectional study was carried out in the physiology department at Viswabharathi Medical College in Kurnool. The Institution's Ethics Committee provided ethical approval. The research comprised 100 I MBBS students aged 17 to 21 who were willing to participate. Medical students with H/o any chronic illness, on any medication, smokers were excluded from the study. Informed consent was taken from all the medical students.

students were divided into 2 groups; Group I-normotensive group (50) with no family h/o hypertension and Group II-hypertensive group (50) with family h/o hypertension. Procedure of the cold pressor test (CPT) was explained to all the students participating in the study. Before the test, subjects were allowed to rest for 10 minutes in a quiet room to reduce the anxiety. Basal blood pressure of all the subjects was measured by Auscultatory method with the help of mercury sphygmomanometer (DIAMOND). First Kortkoff sound indicated systolic blood pressure (SBP) and fifth Kortkoff sound indicated diastolic blood pressure(DBP).

Cold pressor tests were performed in both the study and control groups. After taking their baseline blood pressure, participants were instructed to submerge their left arm in cold water (between 2 and 4 degrees Celsius) for two minutes, and their right arm's blood pressure was

then taken. Blood pressure was tested again 5 minutes after the hand was removed from the cold water.

Statistical analysis: statistical analysis was done using SPSS software version 21. Qualitative data was mentioned in percentage and compared between the groups by chi-square test and quantitative data was mentioned in Mean ±SD and compared between the groups by students t test. p value <0.05 was considered statistically significant.

RESULTS:

The mean age of Group N was 18.70 years and that of Group H was 18.46 years. There were 25 males and 25 females in both the groups. Average BMI was 21.82 kg/m^2 in Group N and that of Group H was 22.58 kg/m^2. Anthropometric parameters were compared between the two groups and there was no significant difference between the 2 groups as shown in Table 1

Table 1: Comparison of participants' characteristics in children of normotensive and hypertensive parents

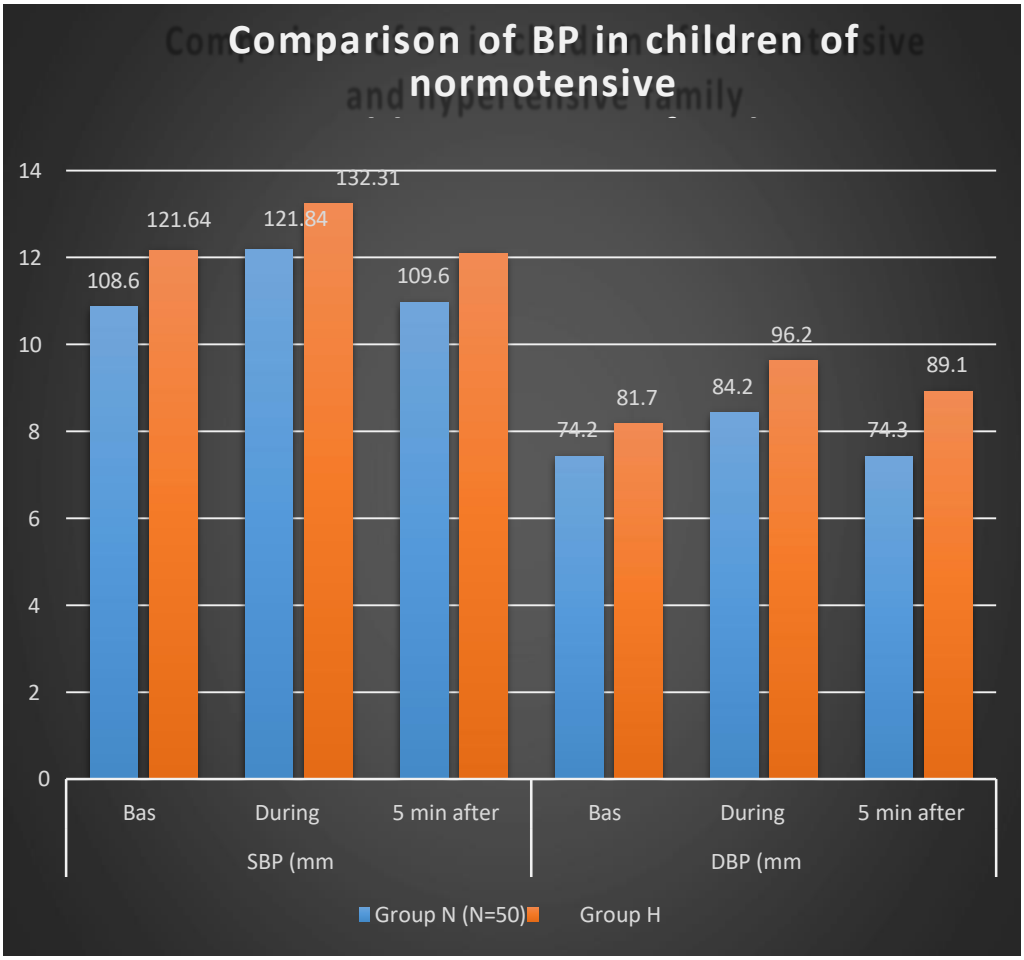
Parameter	**Group N (N=50)**	**Group H (N=50)**	**p value**
Age (years)	18.70± 1.17	18.46± 1.28	0.276
Gender			
Male	**25**	**25**	0.352
Female	**25**	**25**	
BMI (kg/m^2)	21.82± 2.64	22.58±2.86	0.065

On comparison of means of systolic blood pressure and diastolic blood pressure among both the groups, it was observed that the value of systolic blood pressure & diastolic blood pressure was higher in hypertensive group as compared to normotensive group. The rise in systolic and diastolic blood pressure during cold pressor test and 5 min after CPT was significantly higher in children of hypertensive group when compared to the children of normotensives. Diastolic blood pressure in children of hypertensive group did not return to normal levels even 5 minutes after withdrawal of the stimulus as shown in Table 2 & Fig.1.

Table 2: Comparison of BP in children of normotensive and hypertensive family

Parameter	**Conditions**	**Group N (N=50)**	**Group H (N=50)**	**p value**
SBP (mm Hg) Mean±SD	**Basal**	108.64±3.68	121.64±3.54	0.25
	During CPT	121.84±2.82	132.31±4.24	0.03*
	5 min after CPT	109.68±3.52	120.86±3.72	0.02*
DBP (mm Hg) Mean±SD	**Basal**	74.26±1.64	81.73±3.86	0.36
	During CPT	84.28±1.87	96.27±3.62	0.02*
	5 min after CPT	74.32±1.84	89.13±3.18	0.001*

Fig 1: Comparison of BP in children of normotensive and hypertensive family



DISCUSSION:

The current study was designed to study the impact of a cold stimulus on blood pressure in 100 healthy medical students and to identify persons who may develop hypertension as they grow. Arterial blood pressure is an essential physiological measure in cardiovascular disease epidemiology because of its connection with age, height, weight, food, stress, and socioeconomic status. [10] According to reports, those at high risk of hypertension may have an increased stress-induced cardiovascular response at a younger age. [11]

The cold pressor test (CPT), which evaluates blood pressure response to external cold stimuli, has long been used to characterize sympathetic activity and has been shown to predict the likelihood of hypertension in normotensive people. [12] The CPT is known to elicit global sympathetic activation and considerable arteriolar vasoconstriction, which leads to an elevation in blood pressure. [13] The CPT has been proven in studies to raise plasma nor-epinephrine and muscular sympathetic nervous system activity. Increased muscular sympathetic nerve activity is strongly correlated with elevated mean arterial blood pressure and peripheral venous norepinephrine levels. [14]

The sympathetic nervous system plays a critical role in the development of essential hypertension. Subjects with a transitory elevation in arterial blood pressure have been observed to be hyper-responsive to stress stimuli, which is mediated by an overactive sympathetic nervous system. once being triggered by a stressor, the sympathetic system causes an increase in blood pressure; however, blood pressure normally returns to normal within a relatively short amount of time once the stressor is removed. Elevated blood pressure persists for a longer period of time in the vulnerable person because the autonomic control system is incapable of rapidly returning blood pressure to normal. Naturally, those who exhibit increased cardiovascular reactivity to a stressor and a longer rate of recovery after withdrawing the stressor that caused the sympathetic activation may be at a higher risk of developing hypertension later in life. [15]

The current study found a substantial rise in baseline SBP and DBP in the study group of hypertensive parents. In the study group, CPT substantially elevated blood pressure after 5 minutes as compared to the control group of normotensive parents. Even after 5 minutes of stimulus removal, diastolic blood pressure in hypertensive children did not recover to normal values. The results of the current study were comparable to those of Khaliq et al. [16], who

indicated that a rise in diastolic and mean blood pressure was considerably greater in participants with a family history of hypertension, which was similar to our study.

Gupta et al. [17] found that offspring of hypertensive patients had a higher frequency of consistently raised blood pressures than children from families without a history of hypertension. Another study found that the children of two hypertension parents had higher average 24-hour blood pressure than the offspring of two normotensive parents. [18]

CONCLUSION: Children of hypertensive parents who show an elevated and notably prolonged response to diastolic blood pressure as a result of sympathetic stimulation via the cold pressor test may be at high risk of acquiring hypertension early in life. Early identification of hypertension in children with hypertensive parents is critical because lifestyle changes may be implemented at a young age, reducing cardiovascular risk. Routine screening is required to identify asymptomatic hypertension in adolescents with a family history of hypertension.

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