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Blood pressure and pulse rate responses to exercise in students with parental history of hypertension

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Abstract : Background- Hypertension is recognized as a key risk factor for cardiovascular disease mortality and morbidity. Hypertension and related cardiovascular disorders have a familial predisposition. Previous works have shown that exaggerated cardiovascular response to exercise is a valid risk marker for future hypertension.Aim- To evaluate the blood pressure and pulse rate response to physical exertion in normotensive young adult males with parental history of hypertension.Inclusion Criteria- Male students from I II M.B.B.S in the age group of 18-19 years with normal BMI (18.5-24.9 kgm2). Exclusion Criteria- Any acute illness, known Diabetic or Hypertensive, History of chest pain or breathlessness or orthopnea, Physical disability, smokers and Alcoholics. Materials And Methods- A total of sixty healthy normotensive male students from first and second M.B.B.S were chosen for the study. They were classified into two groups based on their parental history of hypertension. Blood pressure and pulse rate were recorded at the base line and during recovery after exercise using bicycle ergometer.Result- The data obtained were statistically analysed using student t test.The study group had increased levels of basal systolic blood pressure, systolic BP immediately after exercise and systolic BP two minutes after exercise compared to the control group.Conclusion- Exercise can reveal the cardiovascular abnormality not present at rest .Thus, exercise testing helps to identify those prone to develop hypertension.

Keyword : Hypertension, Blood pressure, Familial predisposition and BMI.

BLOOD PRESSURE AND PULSE RATE RESPONSES TO EXERCISE IN STUDENTS WITH PARENTAL HISTORY OF HYPERTENSION INTRODUCTION

Hypertension is recognized as a key risk factor for cardiovascular disease mortality and morbidity, **O'Donnell C J et al** (1). **Fredrikson M** suggested that the development of hypertension is preceded by a pre-hypertensive state, that may be manifested by abnormal cardiovascular reactivity to environmental and behavioral challenges(2). To elicit this pre-hypertensive state most useful will be exercise test. Exercise can reveal the cardiovascular abnormality not present at rest and can be used to assess functioning of cardiovascular system. Heart rate and blood pressure changes during exercise and recovery period are analogous with blood pressure responsiveness to daily physical stress conditions. Stress of exercise may unmask a latent tendency towards hypertension, **Tanji JL et al** (3). Previous works have shown that exaggerated cardiovascular response to exercise is a valid risk marker for future hypertension .Thus, the primary objective of this study was to evaluate the blood pressure and pulse rate response to physical exertion in normotensive young adult males with parental history of hypertension.

MATERIALS AND METHODS

Before initiation of the study, approval was obtained from ethical committee of Madurai Medical college, Madurai. A total of sixty healthy normotensive male students from first and second M.B.B.S were chosen for the study. They were classified into two groups based on their parental history of hypertension .Study group consists of 30 students with parental history of hypertension and the control group consists of 30 students with no parental history of hypertension. All participants were informed about the aims and procedures of the study and a written informed consent was obtained .A brief history was taken and general and systemic examinations were performed and their data were collected in data collection proforma. Healthy subjects were chosen based on the inclusion and exclusion criteria.

INCLUSION CRITERIA:

1.Male students from I &II M.B.B.S in the age group of 18-19 years.

2. Male students with normal BMI (18.5-24.9 kg/m^2) Calculated using Quetelet's Index.

EXCLUSION CRITERIA:

Any acute illness.
Diabetes mellitus
Hypertensive.
History of chest pain/breathlessness/orthopnoea.
Physical disability.
Smokers/alcoholics

Subjects were explained about the exercise. Experiments were done in the morning in overnight fasted state between 6.30 am to 8.00 am in the research lab of Institute of Physiology. A mechanically braked bicycle ergometer was used for the experiment. After a rest period of 30 minutes in seated position in a quiet room, prior to the exercise, two values of pulse rate and blood pressure were recorded at 5 minutes interval. The mean of these two values was used as basal pulse rate and basal blood pressure.

Pulse rate was taken by counting the radial pulse for one minute. Blood pressure was measured using a standard mercury sphygmomanometer in the left arm, taking the first and fifth phases of Korotkoff sounds as systolic and diastolic values respectively.

Subjects were instructed to sit on the bicycle ergometer with sphygmomanometer in the left arm .They were asked to start cycling at a work load of 30 watts .The work load was gradually increased at the increments of 10 watts every minute until the subject reached a tolerable exhaustion.

After stopping the exercise, pulse rate was counted immediately after exercise and after two minutes .Likewise post exercise blood pressure was measured immediately and at the end of 2 minutes with subjects seated on the bicycle ergometer without pedaling.

STATISTICAL ANALYSIS OF DATA:

Statistical analysis was done using student t-test to compare between the study and control group.

RESULTS:

The values of Mean + SD of Age & BMI between the two groups shows no significant difference.

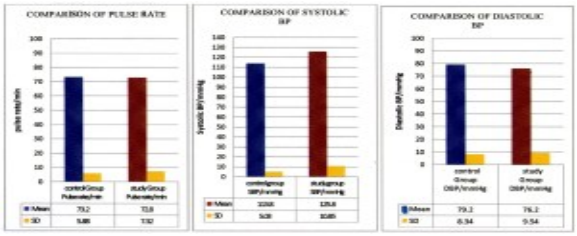
The basal systolic blood pressure was significantly higher in the study group than in the control group (P<0.01) .There was no statistically significant difference in basal pulse rate and basal diastolic blood pressure between the two groups

(TABLE-1).COMPARISON OF BASAL CARDIOVASCULAR PARAMETERS BETWEEN THE TWO GROUPS (TABLE-1)

Parameters	Control group (n=30)	Study group (n=30)	P-values
Basal pulse rate	73.2 + 5.88	72.8 + 7.32	0.1556
Basal systolic BP	113.8 + 5.03	125.8 + 10.85	0.0053**
Basal diastolic BP	79.2 + 8.34	76.2 + 9.54	0.4637

Results expressed as Mean + SD, **P<0.01.

FIG: 1 COMPARISON OF BASAL CARDIOVASCULAR PARAMETERS BETWEEN THE TWO GROUPS



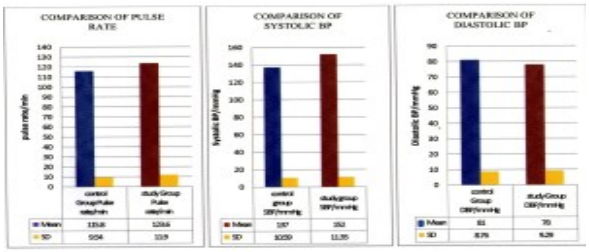
The systolic blood pressure immediately after exercise was significantly higher in the study group than in the control group (P<0.01). There was no statistically significant difference in pulse rate and diastolic blood pressure immediately after exercise between the two groups **(TABLE-2)**

COMPARISON OF CARDIOVASCULAR PARAMETERS IMMEDIATELY AFTER EXERCISE BETWEEN THE TWO GROUPS (TABLE-2)

Parameters	Control group (n=30)	Study group (n=30)	P-values
Pulse rate - Immediately after exercise	115.8 + 9.54	123.6+11.9	0.1243
Systolic BP - Immediately after exercise	137+ 10.59	152 + 11.35	0.0068**
Diastolic BP - Immediately after exercise	81 + 8.76	78 + 9.29	0.4669

Results expressed as Mean + SD, **P<0.01, *P<0.05

FIG: 2 COMPARISON OF CARDIOVASCULAR PARAMETERS IMMEDIATELY AFTER EXERCISE BETWEEN THE TWO GROUPS

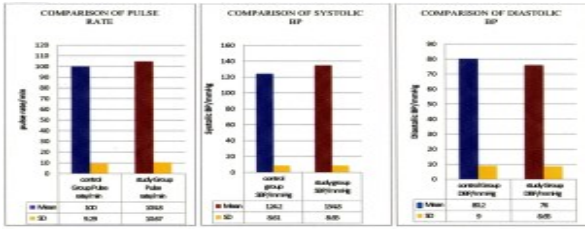


The post exercise recovery systolic blood pressure at 2 minutes was significantly higher in the study group than in the control group (P<0.05). There was no statistically significant difference in pulse rate and diastolic blood pressure two minutes after exercise between the two groups. **(TABLE-3**)

COMPARISON OF CARDIOVASCULAR PARAMETERS TWO MINUTES AFTER EXERCISE BETWEEN THE TWO GROUPS (TABLE-3)

Parameters	Control group (n=30)	Study group (n=30)	P-values
PR- 2 minutes after exercise	100.4 + 9.29	104.8+ 10.67	0.2975
Systolic BP -2 minutes after exercise	124.2+ 8.61	134.8 + 8.65	0.0133*
Diastolic BP -2 minutes after exercise	80.2+ 9.0	76 + 9.3	0.3209

Results expressed as Mean + SD, *P<0.05. FIG: 3 **COMPARISON OF CARDIOVASCULAR PARAMETERS TWO MINUTES AFTER EXERCISE BETWEEN THE TWO GROUPS DISCUSSION**:



Our study shows that subjects with parental history of hypertension had a higher basal systolic blood pressure which is consistent with other studies. They also had increased systolic blood pressure immediately after exercise and two minutes after exercise. The higher systolic blood pressure in the subjects with parental history of hypertension appear to be due to hereditary influence. This hemodynamic pattern can be explained by a hyper reactivity of the sympathetic nerves and an increased vascular response to adrenergic stimulation or by a thickening of the arteriolar wall that alters its ability to respond to vasoconstrictor stimuli . Studies have shown that normotensives with family history of hypertension exhibit altered sympathovagal balance. **Julius et al** suggested that those who have a positive family history of hypertension frequently exhibit hyperactive sympathetic nervous system (4). The consequences of sympathetic nervous system stimulation are peripheral vasoconstriction with an increased heart rate resulting in increase in peripheral vascular resistance with rise in systemic blood pressure.

The importance of parental history in essential hypertension was studied by **Thomas** (5). He showed that the incidence of hypertension in Doctors with parental history of hypertension was greater when one or both parents were hypertensive compared to the Doctors with no such parental history; the incidence was 41.4% and 60.5% when either Doctor's mother or father was found hypertensive, whereas the incidence of hypertension was only 38.9% in Doctors with no such parental history. **Van Hooft IM et al** shown that the systolic blood pressure and mean blood pressure during 24 hours ABPM (ambulatory blood pressure measurement) were significantly higher in normotensives of hypertensive parents than that of controls (6).

Hypertension before the age of 55 years occurs 3.8 times more in persons with positive family history of hypertension **,Williams RR** (7).Genetic predisposition and environmental factors together produced hypertension in most persons**, Busjahn et al** (8). Similarly, school children of hypertensive parents had significantly higher levels of systolic blood pressures and diastolic blood pressures, **Gupta AK** (9). An exaggerated BP response during ergometric exercise was associated with a 3- to 4-fold greater risk for developing hypertension, after controlling for traditional risk factors, **Miyai et al** (10).Thus, many studies have supported the fact that exercise BP measurement in apparently healthy normotensive adults is a valuable means for the identification of those at increased risk of future hypertension.

CONCLUSION:

The ability to detect cardiovascular autonomic changes to exercise in younger age groups will help us to identify those prone to develop hypertension. Thus exercise testing serves as a screening test .Physicians could start interventions in the form of exercise, low salt, low fat diet, stopping smoking habits and life style modifications to delay or avoid the onset of hypertension to lead a peaceful stress free life.

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