

Effect of Exercise on Heart Rate Variability in Children of Diabetic Parents

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Background

Diabetes mellitus is a chronic heterogeneous disorder characterized by chronic hyperglycaemia that develops as a result of interplay between the genetics and environmental factors. A high prevalence of Type 2 Diabetes Mellitus in relatives, especially offsprings, confirms that some individuals have an inherited susceptibility to development of disease. Diabetes is an important risk factor for development of cardiovascular & cerebrovascular diseases and an increased risk of mortality is strongly associated with the presence of cardiovascular autonomic neuropathy. Alteration of circadian rhythm of autonomic activity in offspring of type 2 diabetic parents has been reported, more so if they are insulin resistant. Heart Rate Variability (HRV), the computer assisted quantification of beat to beat fluctuation in heart rate, is a powerful tool for diagnostic & prognostic purposes in pathologies such as diabetes mellitus. Exercise, isotonic or isometric, has been reported to have a beneficial effect on the HRV response.

Aims & Objectives

To determine the early changes in cardiac autonomic modulation by measuring heart rate variability after exercise among healthy subjects and those with parental history of Type 2 DM.

Materials & Methods

The study was conducted in the Department of Physiology, Vardhman Mahavir Medical College & Safdarjung Hospital, New Delhi. It was a cross-sectional study and included subjects, in 18-25 age group, categorized into two groups: Group I: Cases i.e. children of either one or both diagnosed Diabetic parent. Group

II : Controls i.e. subjects with no family history of Diabetes. The subjects were selected on the basis of a questionnaire on 'personal information' filled by medical students studying in Vardhman Mahavir Medical College & Safdarjung Hospital. Anthropometric measurements in the form of Height (ht), Weight (wt), Waist circumference (WC), Waist to hip ratio (WHR), Body surface area (BSA), Body mass index (BMI). BSA and BMI were calculated from height and weight using DuBois nomogram and formula $[wt / (ht)^2]$. Heart rate and Blood pressure were recorded, before & after 1 min, 5min and 20min of cessation of exercise. Heart rate variability (HRV) was deduced from the Electrocardiogram (ECG) which was recorded for 5 minutes prior to exercise and 20 minutes post exercise. Isotonic, moderate exercise was performed using the bicycle ergometer while the handgrip dynamometer was used for isometric exercise.

Results

BMI was observed to be significantly different in the two groups. In response to isotonic exercise, the systolic blood pressure changes acquired statistical significance immediately and 20 minutes after exercise. HRV parameters also showed significant difference in the basal state as well as post-exercise. The response to isometric exercise, while revealing a similar trend in heart rate variability and systolic blood pressure, also displayed statistically significant changes in diastolic blood pressure.

Conclusions

It was concluded that HRV is an effective tool to detect early autonomic dysregulatory changes in asymptomatic offsprings of diabetic parents which may be crucial in preventing future morbidity and mortality.