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"Comparison of Parasympathetic Function Tests in Children of Parents with Diabetes Mellitus with That of Children of Parents without Diabetes Mellitus"

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ABSTRACT

Background: Cardiovascular autonomic dysregulation is a known complication of Type 2 diabetes mellitus. Many studies have documented Autonomic dysfunction in patients with diabetes mellitus. But there are very few studies on cardiac autonomic activity in children of parents with diabetes mellitus. This study was designed to compare parasympathetic activity in children of parents with diabetes mellitus with that of children of parents without diabetes mellitus.

Aims & Objectives:

1. To compare heart rate changes during deep breathing test between study group and control group
2. To compare changes in the R-R interval during lying to standing test between study group and control group

Materials & Methods: Present study was a cross-sectional type of study and consisted of 50 normal children of parents without diabetes mellitus (control group) and 50 normal children having at least one parent with type 2 diabetes mellitus (study group) in the age group of 15 to 25 years involving both males and females. Two parasympathetic function tests i.e. Deep Breathing Test (DBT) and Lying to Standing Ratio (30:15 ratio) were included in the study. Statistical analysis of observations was done using unpaired T test.

Results: There was slightly greater deep breathing difference (DBD) in control group as compared to study group but that was statistically not significant. Also lying to standing ratio (30:15 ratio) in study group as compared to control group was almost same and the difference was statistically not significant.

Conclusion: There were no differences in parasympathetic function tests in Children of Parents with Diabetes Mellitus with that of Children of Parents without Diabetes Mellitus.

Keywords: Parasympathetic function test, Children of type 2 Diabetes mellitus, Deep breathing test, Deep breathing difference, Lying to standing ratio, 30:15 Ratio

INTRODUCTION

Cardiovascular autonomic dysfunction is a notable complication of type 2 diabetes mellitus, though it often goes unrecognized in clinical settings.[1] Children with parental history of diabetes have inherited susceptibility to develop diabetes.[2]

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Cardiovascular Autonomic reactivity refers to cardiovascular responses to potential stimuli, which are essentially reflexive in nature indicating cardiovascular tolerance and adaptation. [3] In most autonomic disorders, parasympathetic function is affected before sympathetic function, so Deep breathing test (DBT) provides a sensitive screening measure for parasympathetic dysfunction in many autonomic disorders.[4] The ratio of R-R intervals corresponding to the 30:15 heart beat is called as 30:15 ratio which is the ratio of longest R-R interval around 30th beat divided by shortest R-R interval around 15th beat after standing. The 30:15 ratio is also a measure of parasympathetic function. [5]

Previous studies have shown genetic factors in the form of altered genes may pass from diabetic parents to their offsprings and could manifest as an altered response in parasympathetic function tests in healthy offsprings of diabetic parents even before the offsprings developing diabetes. [6] But there are very few studies on cardiac parasympathetic activity in children of parents with diabetes mellitus.

The aims and objectives of present study were to compare heart rate changes during deep breathing test between study group and control group and to compare changes in the R-R interval during lying to standing test between study group and control group.

MATERIALS AND METHODS

The present study was conducted in the Department of Physiology, K J Somaiya Medical College, Mumbai, Maharashtra, India. Institutional ethical committee approval was taken before commencement of the research.

The subjects were asked to refrain from ingesting any beverages containing caffeine and alcohol for at least 12 hours prior to the study. They were asked to report between 10 a.m. to 12 p.m. in the lab after an adequate night's sleep followed by light breakfast. Written informed consent was taken before the clinical examination of the subject. The subject was allowed to relax on a bed in supine position for 10 minutes and then parasympathetic function tests were performed after initial 1-2 sessions of practice.

Parasympathetic function tests:

1. Deep breathing test (DBT)

The subject was instructed to keep breathing smooth, slow & deep. First baseline ECG was recorded for 1 minute in supine position using "Polygraph by RMS positive dynamics". The subject was then given hand signal to maintain the rate & timing of the breathing. During DBT subject was asked to do maximal inspiration for 5 seconds and maximal expiration for 5 seconds for 6 cycles per minute. Difference between maximum heart rate during inspiration & minimum heart rate during expiration averaged over 6 cycles & Deep Breathing Difference (DBD) was calculated.

2. Lying to standing ratio (30:15)

Baseline ECG was recorded for 1 minute and then subject was asked to attain the standing posture within 3 seconds without any support. 30:15 ratio, which is the ratio of longest R-R interval around 30th beat divided by shortest R-R interval around 15th beat after standing was calculated.

Statistical analysis of the observations was carried out using unpaired T test.

RESULTS

There was slightly greater deep breathing difference (DBD) in control group as compared to study group but that was statistically not significant. Also lying to standing ratio (30:15 ratio) in study group as compared to control group was almost same and the difference was statistically not significant.

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Table 1: Comparison of Deep Breathing Difference between study group and control group

	Study group	Control group	P value	Significance
	Mean ± S.D.	Mean ± S.D.		
DBD (bpm)	31.73±5.42	34.86±8.76	0.9	**Statistically NOT significant**

(DBD – Deep breathing difference, bpm – Beats per minute)

Table 2: Comparison of 30:15 ratio between study group and control group

	Study group	Control group	P value	Significance
	Mean ± S.D.	Mean ± S.D.		
30:15 ratio	1.48±0.18	1.42±0.2	0.6	**Statistically NOT significant**

DISCUSSION

The subjects included in the study were similar in terms of age and BMI (Body mass index).

In the present study, there was slightly greater deep breathing difference in the control group (34.86±8.76) as compared to study group (31.73±5.42) however the difference was not statistically significant. (P value = 0.9) Also lying to standing ratio (30:15 ratio) in the study group (1.48±0.18) and control group (1.42±0.2) was almost same and the difference was statistically not significant. (P value = 0.6)

This is in accordance with the study done by Goel et al which shows a decrease in all the three parasympathetic function tests (heart rate variability in response to deep breathing, heart rate variation in response to standing, and valsalva maneuver) in offsprings of type 2 diabetic parents (cases) as compared to non-diabetic parents (controls). However, the results were not statistically significant. [6] Similarly study done by Sangeeta Tuppad et al showed that there was insignificant decrease in parasympathetic functions in study group (healthy offsprings of Type 2 Diabetic parents) as compared to study group (healthy offsprings of Nondiabetic Parents). So, there may be increased prevalence of cardiac autonomic neuropathy in offsprings of nondiabetic parents.[7]

Whereas according to Bagudai S et al, parental history of diabetes does not have any impact on the cardiovascular autonomic activity before the disease manifestation.[8]

As the changes in parasympathetic function tests in both the groups were not statistically significant, we conclude here that there is no impairment of parasympathetic activity in healthy offsprings of diabetes mellitus as compared to children of non-diabetic parents. It may be due to younger age group of volunteers.

Given that this study was conducted on a limited sample size, further research on a larger group of individuals would be required to validate the findings.

CONCLUSION

There were no differences in parasympathetic function tests in Children of Parents with Diabetes Mellitus with that of Children of Parents without Diabetes Mellitus.

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