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# CARDIOVASCULAR VARIABILITY IN NON-DIABETIC OFFSPRING OF DIABETIC PARENTS BY USING HANDGRIP DYNAMOMETER

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## ABSTRACT

Cardiovascular variability in non-diabetic off springs of diabetic parents by using handgrip dynamometer. Sympathetic activation has been considered as a link between type 2 Diabetes Mellitus, and hypertension. Diabetes Mellitus is one of the important endocrine disorders that are associated with vascular symptoms. This is a Case-control study which was done with 30 non diabetic off springs (both male and female) of diabetic parents with age group between18–25. 30 offsprings (both male and female) of non-diabetic parents, matched age and anthropometric data were recruited as controls. Cardiovascular variability was assessed by blood pressure variation by handgrip dynamometer. SBP in case group found with an average of (131.40±13.16) mm hg and diastolic blood pressure in case group found with an average of (85.13± 6.18) mm hg diastolic and in control group SBP average is (130.03±12.84) mm Hg and diastolic blood pressure in control group is (86.53± 7.57), for SBP pvalve = 0.1933, and for diastolic blood pressure =0.3421which is in though there is slight increase in SBP in study group comparing to control group. There is no significant change in SBP as well as DBP in case group after 1 minute of sustained handgrip dynamometer as ($p>0.05$). Though there are slight changes in observed values of SBP & DBP, which are not statistically significant. There is a chance for developing diabetes and hypertension in future due to hereditary factors, these individuals has to be carefully monitored by advising regular exercise and dietary management.

**KEYWORDS:** Diabetes mellitus, Blood pressure, Handgrip dynamometer, Cardiovascular variability.

## INTRODUCTION

Diabetes mellitus (DM) is a global health issue affecting children, adolescents, and adults. According to the World Health Organization, approximately 180 million people worldwide currently have type 2 DM (formerly called adult-onset diabetes); over 95% of people with diabetes have this form. The number of people with type 2 DM is estimated to double by 2030 (1). The prevalence of diabetes in 15 major states of India is 7·3% (95% CI 7·0–7·5) India has already become the diabetes capital of the world with over 3 crores affected patients. Between 1995 and 2025, this is predicted to be a 35% increase in the world wide prevalence of diabetes (2). Diabetes is a growing challenge in India with estimated 8.7% diabetic population in the age group of 20 and 70 years (3).

Common symptoms include increased thirst, urination and unexplained weight loss. Symptoms may also include hunger, feeling tired and sores that do not heal (4).

Diabetes complications are divided into micro-vascular (due to damage to small blood vessels) and macro-vascular (due to damage to larger blood vessels). Micro-vascular complications include damage to eyes (retinopathy) leading to blindness, to kidneys (nephropathy) leading to renal failure and to nerves (neuropathy) leading to impotence and diabetic foot disorders. Macro-vascular complications include cardiovascular diseases such as heart attacks, strokes and insufficiency in blood flow to legs (5).

The autonomic nervous system (ANS) is the part of the peripheral nervous system that acts to control visceral functions largely below the level of consciousness, such as heart rate, digestion, respiratory rate, salivation, perspiration, pupil diameter, micturition, and sexual arousal (6).

Its main aim is to maintain the optimal internal environment (Homeostasis) of the body. Thus it governs body functions which are normally carried out without conscious control or awareness. This is why ANS is also called Vegetative or Efferent visceral or involuntary nervous system (7).

Testing grip strength is a popular assessment used by occupational therapists in a range of clinical settings. It is fast, easy to perform, reliable and produces a result

which is simple to record. Results of grip strength testing have been used to determine a baseline measure of performance against which change can be compared, as well as comparison of results to normative data (8).

## MATERIALS AND METHODS

### Source of Data and Study group

Thirty (30) non diabetic off springs with parental history of diabetes was taken as case and thirty (30) individuals years without history of parental diabetes were taken as controls, both are with a age group between 18 -25 years.

The subjects must having no history of diabetes, hypertension or other illness involving sympathetic nervous system were recruited for the study after obtaining the approval of Institutional Ethical Committee, of Era's Lucknow Medical College, Lucknow, India.

### Inclusion Criteria

- Young subjects of 18 to 25 years of age**.**
- With and without parental diabetes history.

### Exclusion Criteria

The following subjects will be excluded from the study.

- History of Diabetes Mellitus.
- History of chronic disorder like Cardiovascular, tuberculosis, Hypertension.
- History of chronic Alcohol consumption.
- History of tobacco consumption.
- Subjects receiving drug (corticosteroids, beta blocker)

## METHODOLOGY

This study was carried out in the department of Physiology, Era's Lucknow Medical college, Era University, Lucknow. The study was conducted on thirty (30) non diabetic offspring with parental history of diabetes were taken as cases and thirty (30) non diabetic offspring without history of parental diabetes were taken as controls.

A detailed relevant clinical history about the subjects and their parents was obtained from them. This is followed by a brief general physical examination and a complete systemic examination. Healthy, normotensive subjects who are non smokers and non alcoholic are included in this study. Those subjects who are regularly smokers and drinkers, history of any respiratory, cardiovascular, endocrine and neurological disorders, suffering from Diabetes Mellitus were excluded from the study.

**Experimental procedure:** After taking written consent, subjects were asked to report in laboratory in the morning after consuming a light standard breakfast 1hr before arrival. Subjects were instructed to abstain from the use of caffeine and other stimulants for 24hr before the study. Height was measured using a standard anthropometer. Weight was measured using calibrated weighing machine. Body mass index (BMI) was calculated (according to WHO) (9) as the weight in kilograms divided by the square of height in meters.

$$BMI = \frac{Weight\ (Kg)}{Height2\ (m2)}$$

**Measurement of Blood Pressure:** The blood pressure was recorded from the non dominating arm by using mercury sphygmomanometer; cuff was kept tied for next measurement of blood pressure.

**Blood pressure response to isometric eercise: (7)**

| Diastolic blood pressure | Response |
|---|---|
| More than 15mmHg | Normal |
| Between 11-15mmHg | Borderline |
| Less than 10mmHg | Abnormal (an indicator of sympathetic insufficiency) |

## OBSERVATIONS

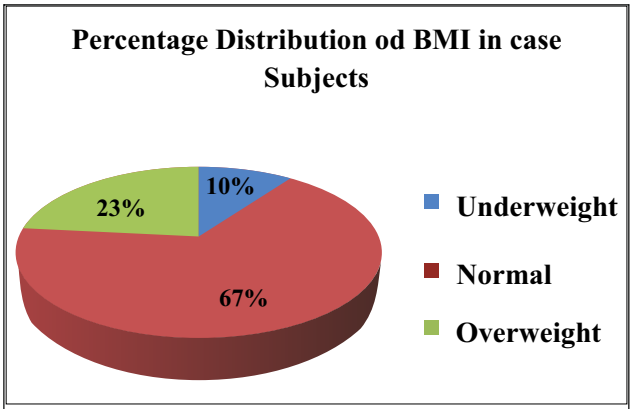


***Chart no.1. This Chart Shows The Percentage Distribution of BMI Cases In Which10% Are Underweight, 67% Are Normal And 23% Are Overweight. No Obese Subjects.***

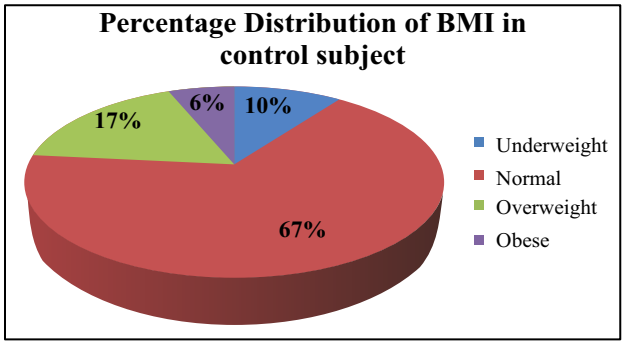


***Chart 2: This Chart Shows The Percentage Distribution Of BMI Of Control In Which 10% Are Underweight, 67% Are Normal, 17% Are Overweight And 6% Obese Are Found***

| Nutritional Status | Cases (n=30) | | Control (n=30) | |
|---|---|---|---|---|
| BMI(Kg/m$^2$) | Numbers | Mean ± SD | Numbers | Mean ± SD |
| Underweight (<18.5) | N=6 | 17.20±0.97 | N=3 | 16.41±1.36 |
| Normal (≥18.5-≤24.99) | N=20 | 21.55±2.04 | N=20 | 20.98±1.80 |
| Overweight (≥25-≤29.99) | N=4 | 27.32±0.79 | N=5 | 28.12±0.63 |
| Obese(>30) | -- | -- | N=2 | 31.23±1.11 |

***Table 1: Body Mass Index (BMI) of The Volunteers (According To WHO) (10)***

The above table shows the distribution of control and case individuals, on the basis of their anthropometric details in which the mean±SD of weight was found to be 57.8±9.35 in cases. Similarly in control subjects mean weight found to be 60.3±10.84 kilograms. Whereas the height found 1.65±0.08 in control group and in case group it is found 1.64±0.08 BMI was found to be 22.19±4.03 in control group and in case group mean±SD BMI was found to be21.45±3.38.

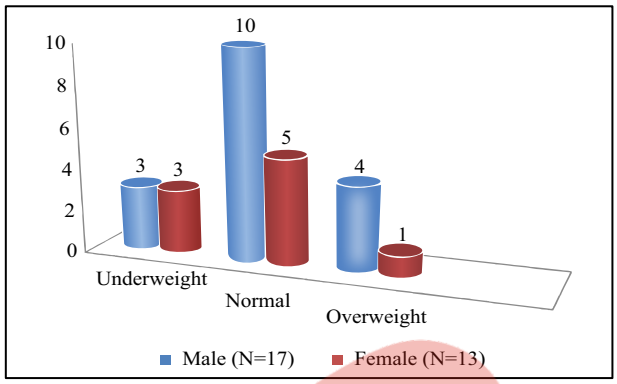


***Chart 3: This Chart Shows The Percentage Distribution Of BMI In Cases In Males Category Underweight,(n=4), Normal(n=7), Overweight(n=0) Are Found. In Female Category Underweight,(n=6), Normal(n=11), Overweight(n=1) Are Found. No Obese Subjects Are Found***

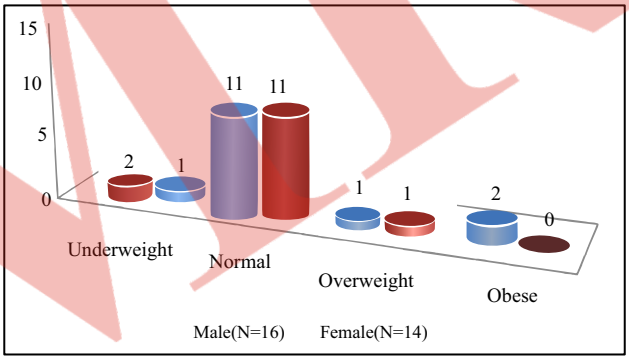


***Chart 4: This Chart Shows The Percentage Distribution Of BMI In Among Control Subjects. In Males Category Underweight,(n=2), Normal (n=11), Overweight(n=1) And Obese (n=2) Are Found. In Female Category Underweight,(n=1), Normal(n=11), Overweight(n=1) No Obese (n=0) Are Found***

| | Systolic Blood Pressure (mmHg) | | Diastolic Blood Pressure (mmHg) | | (difference between baseline DBP and DBP after 1 min Isometric handgrip test) |
|---|---|---|---|---|---|
| | Baseline | After 1 min of IHT | Baseline | After 1 min of IHT | |
| **Subjects** | Normal | After 1 min. handgrip test | Normal | After handgrip test | |
| **Control** | (Mean ± SD) | (Mean ± SD) | (Mean ± SD) | (Mean ± SD) | |
| **Male (N=16)** | 113.88±10.39 | 133.94±13.54 | 72.00±6.24 | 87.63±6.38 | 15.63 |

***Table 2: This Table Shows Mean Values And 95% Confidence Intervals Of Systolic And Diastolic Blood Pressure At Rest, Just After Isometric Exercise And After 1 Minute Of Isometric Exercise In Control And Case Group***

| | | | | | |
|---|---|---|---|---|---|
| **Cases Male (N=17)** | 120.35±13.40 | 134.41±12.81 | 72.24±6.36 | 87.59±6.35 | 15.35 |
| **p value** | 0.1330 | 0.9190 | 0.9136 | 0.9857 | |
| **Control Female (N=14)** | 110.00±8.15 | 125.57±10.76 | 70.14±8.09 | 85.29±8.83 | 15.14 |
| **Case Female (N=13)** | 113.38±11.70 | 127.46±13.06 | 66.46±6.12 | 81.92±4.33 | 15.46 |
| **P value** | 0.3751 | 0.6841 | 0.1972 | 0.0541 | |

***Cont. Table 2: This Table Shows Mean Values And 95% Confidence Intervals Of Systolic And Diastolic Blood Pressure At Rest, Just After Isometric Exercise And After 1 Minute Of Isometric Exercise In Control And Case Group***

In the above table baseline SBP among control (both male and female) and case (both male and female) have pvalue >0.05 and Baseline DBP among control (both male and female) and case (both male and female) have pvalue >0.05. Difference between mean baseline DBP and diastolic blood pressure after 1 minute of exercise found to be 15.50 among control males and 15.27 among case male. Similarly among control females it is 16 and among geriatric females15.11

## DISCUSSION

Chronic patients with uncontrolled diabetes mellitus lead to lots of, primarily vascular, complications that affect small vessels are called microvascular, large vessels macrovascular complication or both.[11] Evidence is available indicating that siblings of diabetic parents are at increased risk of developing diabetes, and the risk increases if grandparents are also diabetic.[12] In a study among Pima Indians, the incidence of the disease was shown to be highest if both parents were diabetic.[13]

We all know that it is necessary for proper functioning of most of visceral organs there must be a proper balance between sympathetic and parasympathetic system. Cardiovascular system is very much depending on the sympatho-parasympathetic balance. Imbalance may leads to increased susceptibility for hypertension, stroke, MI etc. in this study we focused on sympathetic component of autonomic nervous system using handgrip dynamometer as a stimulus Cardiovascular Variability in Non-Diabetic Offspring of Diabetic Parents by Using Handgrip Dynamometer

Sympathetic efficiency is observed by the difference between mean baseline diastolic blood pressure and diastolic blood pressure after 1 minute of exercise. It is found to be 15.63 among control males subjects and 15.35 among cases males, similarly it I found 15.14 among control females subjects and 15.46 among cases females. Both control and case individual shows normal response because they are young and healthy.

## CONCLUSION

This study is done at Era's Lucknow Medical College and Hospital, Era University in the Department of Physiology.

This is a cross sectional study. In this study, 30 healthy offsprings of diabetic parents (both male and female) and 30 healthy offsprings of non-diabetic parents (both male and female) subjects between were included. Subjects were in between 18-25 The study was done to compare the cardiac autonomic variability in healthy offsprings of diabetic parents and healthy offsprings of non-diabetic parents. The parameters studied were different subgroups of Body Mass Index i.e. Underweight, Normal weight, Overweight and Obese groups.

Blood pressure was taken before the isometric exercise and assessment of cardiac autonomic variability by the sustained of handgrip dynamometer in dominant hand just after the sustain blood pressure was recorded as earlier as possible. The data was analyzed using Statistical Package for Social Sciences (SPSS) version 20.0

At the end of the study there are slight changes are observed in the values of SBP & DBP, which are not statistically significant and blood pressure response to isometric exercise (difference between baseline DBP and DBP after 1 minute of exercise) is found to be normal (more than 15mm Hg). Therefore this time of study these individuals (cases) shows no effect of diabetes as their parents are diabetic. There may be chance for developing diabetes and hypertension in future due to hereditary factors, these individuals has

to be carefully monitored by advising regular exercise and dietary management.

## LIMITATIONS OF STUDY

In this study the sample size is less therefore results are not significant. Further more study must be done with large sample size so that we can assess the sympathetic change in offsprings of diabetic parents through which we can aware them for disease in future.

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