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A comparative study on cardiovascular parameters in Normal & Type 2 Diabetes mellitus patients

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Abstract
Background: *Current interest centers on the development of a new generation of tests of autonomic nerve function that are simple, non- invasive, reproducible and allow precision in diagnosis and accurate quantization. Most of them are based on cardiovascular reflexes and abnormality in them is assumed to reflect autonomic damage elsewhere.*
Methods: *The study was carried out in 100 Type-2 diabetic patients with duration of diabetes ranging from 5 years to 20 years. Control Group consists of 100 normal individuals who matched with case in age, sex and socio economic condition as far as possible. Age group 40-60 years.*
Results: *The mean value of heart rate in 100 Diabetic patients was found to be 85.13 ±11.23 per minute which higher when compared with the mean value of heart rate in 100 normal people which is 83.21 ±11.24 per minute. But this difference was statistically Insignificant (p>0.05).Mean arterial pressure of Diabetic patients was found to be 94.12±7.28 mmHg which again is more than mean arterial pressure of normal persons which is 92.13±7.01 mmHg. Though there is a difference in mean arterial pressure among two groups, but it was statistically Insignificant (p>0.05).*
Conclusion: *In diabetic patients, there is increased need for regular health checkups especially of the cardiovascular system to prevent complications and to effectively control the blood sugar levels.*
Keywords: *Diabetes mellitus, Cardiovascular changes, Heart rate, Mean arterial pressure.*

Introduction

According to International Diabetes Federation (IDF), 415 million people have diabetes mellitus in the world and 78 million people in the South East Asian (SEA) Region; by 2040 this will rise to 140 million. There were 69.1 million cases of diabetes in India in 2015 with prevalence among adults being 8.7%.[1] Diabetes is a complex chronic disease that requires regular medical follow-up. Diabetes care involves a change in lifestyle (healthy eating, physical activity, stopping smoking, weight control), self management of the disease (adherence to the medication, self-monitoring of blood glucose) and the prevention of complications (adherence to foot care and screening for vision and kidney problems).[2-3] These complications can be divided into macro vascular and micro vascular. With the increased duration of diabetes mellitus, the risk for complications also increases substantially.

Measurement of Heart Rate Variability (HRV) is the best non- invasive method to measure the working of the heart, as it measures many aspects of cardiac functioning, including autonomic nerve functioning. The new method can replace the traditional manual method for evaluating cardiovascular responses with the advantages of speed and objectivity. Analysis of 5 minutes measurements of heart rate variability (HRV) has been shown to be a good predictor of physiological distress and mortality, especially for cardiovascular disease.[4]

Neuropathy is one of the most common complications of diabetes.[5] Silent myocardial infarct is more common in diabetics due to involvement of cardiac autonomic nerves. At an early stage autonomic dysfunction may be asymptomatic or mildly symptomatic.

Symptomatic autonomic neuropathy carries worst prognosis, so early diagnosis is essential for maximum benefit more so in diabetes. Heart rate variability monitoring plays a vital role in prevention and early diagnosis of cardiac autonomic neuropathic complications.[6]

Materials and Methods

Type of study- This study was case-control type of study where individuals suffering from diabetes mellitus were considered as cases and normal healthy individuals were considered as controls

The present study was conducted in two groups classified as

Group (1)100 normal individuals

Group (2) 100 Diabetics Type-2

Determination of diabetic status- The criteria for diagnosis of diabetes mellitus are as follows. Symptoms of diabetes plus random blood glucose concentration ≥ 11.1 mmol/L (200mg/dl) (OR) Fasting plasma Glucose ≥ 7.0mmol/L (126mg/dl) (OR) Two- hour plasma glucose ≥ 11.1 mmol/L (200 mg/dl) during an oral glucose tolerance test. The same procedure was followed in control subjects to exclude the inclusion of asymptomatic diabetic subjects in control group.

Inclusion Criteria

1) Only normal healthy subjects, without any family history of diabetes mellitus, known chronic disease and not using any medicine for any reason, were included in the study as control group.
2) Established diabetic patients of type II were included in case group.
3) Confirmed diabetic patients whose blood sugar level was controlled on taking oral hypoglycaemics were also included in the case group.

Exclusion Criteria

1) History of Hypertension (sitting blood pressure > 140/90 mmHg).
2) History of alcohol / smoking.
3) History of intercurrent illness (e.g.- Pyrexia, Diarrhea).
4) History of drug intake.
5) Ages below 17 years and above 70 years.

Methods

1) Measurement of Heart rate. The measurement of heart rate to assess cardiac arrhythmia.
2) Measurement of Blood Pressure: By Mercury Sphygmomanometer. Both systolic and diastolic pressure is measured by auscultation method by tying cuff to right arm in sitting position.

Mean arterial blood pressure is calculated with the help of formula. MAP = Diastolic Bp + 1/3 of Pulse Pressure Blood Pressure is measured to identify contributory factors and underling causes (Secondary hypertension) and to assess other risk factor and to detect any complication.

Data Analysis- Student's T-test and Chi-square test were applied. Results were presented as mean ± SD or no. of patients (percent); P value <0.05 defined statistical significant difference.

Results

A total sample size of 200 with 100 normal individuals and 100 diabetic patients were included in the study.

Table 1: Socio-demographic variable

Socio-demographic variable	Group-I	Group-II	p-value
Age (Yrs) Mean±SD	50.21 ± 7.3	50.16 ± 7.6	>0.05
Male : Female	63 : 37	64 : 36	>0.05

Mean age of the group-I was 50.21±7.3 years and group-II was 50.16±7.6 years. Majority were males in both group as compared to females.

Table 2: Comparison of heart rate of normal persons and diabetic patients

Heart rate	Group-I	Group-II
Mean	83.21	85.13
SD	11.24	11.23
p-value	>0.05	

The mean value of heart rate in 100 Diabetic patients was found to be 85.13 ±11.23 per minute which higher when compared with the mean value of heart rate in 100 normal people which is 83.21 ±11.24 per minute. But this difference was statistically Insignificant (p>0.05)

Table 3: Comparison of Mean arterial pressure of normal persons and diabetic patients

Mean arterial pressure	Group-I	Group-II
Mean	92.13	94.12
SD	7.01	7.28
p-value	>0.05	

Mean arterial pressure of Diabetic patients was found to be 94.12±7.28 mmHg which again is more than mean arterial pressure of normal persons which is 92.13±7.01 mmHg. Though there is a difference in mean arterial pressure among two groups, but it was statistically Insignificant (p>0.05)

Discussion

The mean value of heart rate in 100 Diabetic patients was found to be 85.13 ±11.23 per minute which higher when compared with the mean value of heart rate in 100 normal people which is 83.21 ±11.24 per minute. But this difference was statistically Insignificant (p>0.05)

Similar results were found in previous studies of Ewing DJ, Martyn CN (1985)[7], Ziegler D, Zentel C in(2006)[8] where it was proved that heart rate of Diabetic are more when compared to normal due to vagal damage or due to decrease vagal tone.

Mean arterial pressure of Diabetic patients was found to be 94.12±7.28 mmHg which again is more than mean arterial pressure of normal persons which is 92.13±7.01 mmHg. Though there is a difference in mean arterial pressure among two groups, but it was statistically Insignificant (p>0.05)

According to previous studies of Grossmann et al (1996)[9]in Ann Intern Med (1996) patient with Diabetes and hypertension have a higher incidence of coronary artery disease than do patient with Diabetes or Hypertension alone. In Isfahan Diabetes prevention study[10] there is increase in systolic & diastolic pressure and also increase in mean arterial pressure in Diabetics and they are also at high risk.

Conclusion

In diabetic patients, there is increased need for regular health checkups especially of the cardiovascular system to prevent complications and to effectively control the blood sugar levels.

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