

**Left Ventricular Diastolic Dysfunction in type 2 Diabetes Mellitus: A Cross Sectional Study**Amulya Visweswar<sup>1</sup>, Uday Girijakanth<sup>2</sup>, Prashanth N C<sup>3</sup><sup>1</sup>Assistant Professor, Department of General Medicine, B G S Global Institute of Medical Sciences, Bengaluru<sup>2</sup>Assistant Professor, Department of General Medicine, Sri Siddhartha Institute of Medical Sciences and Research Centre, T Begur, Bengaluru Rural, Karnataka<sup>3</sup>Assistant Professor, Department of General Medicine, Sri Siddhartha Institute of Medical Sciences and Research Centre, T Begur, Bengaluru Rural, Karnataka

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Conflict of interest: Nil

**Abstract:****Introduction:** Patients with diabetes have a two to four fold increase in the risk of coronary artery disease (CAD). Patients with diabetes have an absolute risk of CAD death more than three times higher than that in the non-diabetic cohort even after adjustment for established risk factors.**Aim:** to study left ventricular diastolic dysfunction in asymptomatic normotensive patients with Type II Diabetes Mellitus.**Method:** This was a prospective cross sectional study where diabetic patients attending the out patient department and admitted to various wards of Dr. B. R. Ambedkar Medical College and hospital, K. G. Holli. Bengaluru, were selected randomly for enrollment into the study after consideration of inclusion and exclusion criteria.**Results:** Among 41 patients with 1 – 5 yrs duration of diabetes, 34 had normal filling pattern, whereas among 28 patients with > 10 yrs duration of diabetes all patients had diastolic dysfunction. (p<0.001).**Conclusion:** Diastolic dysfunction was observed in 54% among 100 subjects out of these 43% had impaired relaxation and 11% had pseudo normal filling.**Keywords:** Diabetes, diastolic dysfunction, normotensive.

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**Introduction**

Diabetes Mellitus comprises a group of common metabolic disorders that share the phenotype of hyperglycemia, resulting from reduced insulin secretion, decreased glucose utilization and increased glucose production.[1] The metabolic dysregulation associated with diabetes mellitus causes secondary pathophysiologic changes in multiple organ systems that impose a tremendous burden on the individual with diabetes and on the health care system. Patients with diabetes have a two to four-fold increase in the risk of coronary artery disease (CAD). Patients with diabetes have an absolute risk of CAD death more than three times higher than that in the non-diabetic cohort even after adjustment for established risk factors.[2]

Further support for the existence of a diabetic cardiomyopathy was provided by Hamby et al., who noted an increased incidence of diabetes in patients with idiopathic cardiomyopathy.[3,4] The non-invasive evaluation of cardiac performance utilizing systolic time intervals, phonocardiography, M-mode and two – dimensional echocardiography and

Doppler echocardiography has also documented sub clinical left ventricular dysfunction in diabetic individuals. The current study aimed to study left ventricular diastolic dysfunction in asymptomatic normotensive patients with Type II Diabetes Mellitus.

**Method**

This was a prospective cross-sectional study where diabetic patients attending the outpatient department and admitted to various wards of Dr. B. R. Ambedkar Medical College and hospital, K. G. Holli. Bengaluru, were selected randomly for enrollment into the study after consideration of inclusion and exclusion criteria.

A detailed history was taken, clinical examination and investigations performed as per proforma in all cases. Ethical clearance for the study was obtained from Ethical committee of Dr. B. R. Ambedkar Medical College and hospital, K. G. Holli. Bengaluru. A total of 100 patients diagnosed to have Type II Diabetes Mellitus with preserved systolic function

(EF > 58%) were studied from November 2015 to October 2016.

#### Inclusion Criteria

1. All patients with type II Diabetes Mellitus between age group of 35-60 years.
2. BP < 130/85 mm Hg in sitting posture on  $\geq 2$  separate occasions.
3. Asymptomatic, without prior history or symptoms suggestive of hypertension, coronary artery disease, valvular heart disease or congestive cardiac failure.

#### Exclusion Criteria

1. Newly detected type II Diabetes Mellitus i.e less than 1 year duration.
2. Any kind of acute complication of diabetes.

3. Patients on antihypertensive medication.
4. Past history of myocardial infarction, unstable angina.
5. Patients with rheumatic heart disease.
6. Evidence of renal dysfunction.

#### Results

A total of 100 patients with Type II Diabetes were included in the study. The number of males was 49 and of that of females was 51. Most cases (41%) were between 56-60 years of age.

The prevalence of diastolic dysfunction was minimum in younger age group patients and maximum among older age group patients. High statistical significance was found between age and incidence of diastolic dysfunction signifying that age is an important contributor.

**Table 1: Age distribution of cases**

| Age          | Normal    | %     | DD [Diastolic Dysfunction] | %     |
|--------------|-----------|-------|----------------------------|-------|
| 36-40        | 7         | 77.7  | 2                          | 22.3  |
| 41-45        | 5         | 62.5  | 3                          | 37.5  |
| 46-50        | 10        | 55.55 | 8                          | 44.45 |
| 51-55        | 14        | 58.33 | 9                          | 41.66 |
| 56-60        | 10        | 19.60 | 32                         | 80.39 |
| <b>Total</b> | <b>46</b> |       | <b>54</b>                  |       |

**Table 2: Showing relationship between duration of diabetes and diastolic function**

| Duration of Diabetes | Normal n = 46 | D D n = 54  |
|----------------------|---------------|-------------|
| 1 – 5 yrs            | 34 (73.91%)   | 7 (12.96%)  |
| 5 – 10 yrs           | 12 (26.08%)   | 19 (35.18%) |
| > 10 yrs             | 0 (0%)        | 28 (51.85%) |

Among 41 patients with 1 – 5 yrs duration of diabetes, 34 had normal filling pattern, whereas among 28 patients with > 10 yrs duration of diabetes all patients had diastolic dysfunction. This was a statistically significant finding ( $p < 0.001$ ). This shows that diastolic dysfunction correlates positively with duration of diabetes.

**Table 3: Diastolic Function in Cases**

| Diastolic function    | Number n = 100 | %    |
|-----------------------|----------------|------|
| Normal                | 46             | 46.0 |
| Impaired relaxation   | 43             | 43.0 |
| Pseudo normal filling | 11             | 11.0 |

Among 100 subjects studied 46 patients had normal diastolic function, 43 patients had impaired relaxation (i.e E/A ratio < 1) 11 patients had Pseudo normal filling pattern. Totally 54 patients had diastolic dysfunction.

#### Discussion

Diabetes affects various organs like heart central nervous system, retina, kidneys and blood vessels. Diabetes Mellitus is associated with a multitude of cardiovascular complications like increased incidence of atherosclerotic coronary artery disease, myocardial infarction, congestive heart failure, coronary microangiopathy and systemic arterial hypertension. In, addition, structural myocardial involvement termed as diabetic cardiomyopathy may be

there.[5,6] In our study, the mean age of patients was  $52.34 \pm 8.6$  yrs. This was comparable with Poirier et al [7], Zabalgoitia et al [8] and Khan et al [9] whose mean age was  $56 \pm 7$  yrs,  $49 \pm 7$  yrs and  $47.54 \pm 6.78$  yrs respectively. In our study, the mean duration of diabetes of patients was 7.37yrs. This was comparable with Poirier et al, Zabalgoitia et al and Khan et al whose mean duration was 6.5 yrs, 6.5 yrs and 6.3 yrs respectively. In our study, the mean ejection fraction of patients was  $64 \pm 2.6\%$ . This was comparable with Poirier et al, Zabalgoitia et al and Khan et al whose mean ejection fraction was  $66 \pm 5\%$ ,  $65 \pm 5\%$  and  $68.75 \pm 6.42\%$  respectively. The mean E/A ratio in our study was  $0.81 \pm 0.06$  which was comparable with Poirier et al and Khan et al where E/A ratios were  $0.79 \pm 0.07$  and  $0.76 \pm 0.12$  respectively. Our

study was conducted on 100 normotensive Type 2 diabetic patients out of which 54% had diastolic dysfunction. Among these 43% had impaired relaxation and 11% had pseudonormal filling. These results were comparable with Poirier et al where study of 46 patients revealed a total diastolic dysfunction of 60% of which 32% were impaired relaxation and 28% were pseudonormal pattern. Khan et al study showed a diastolic dysfunction of 60% where 36% were impaired relaxation and 24% were pseudonormal filling pattern.

### Conclusion

Diastolic dysfunction was observed in 54% among 100 subjects out of these 43% had impaired relaxation and 11% had pseudo normal filling.

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