

## Original Research Article

# Assessment of cardiac complication in diabetic patient of rural India

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### ABSTRACT

**Background:** Diabetes mellitus (DM) is a common endocrine disorder affecting approximately 382 million people worldwide. Diabetes mellitus (DM) is group of metabolic disorder in which glucose is underutilized, thus producing hyperglycemia resulting from a defect in insulin secretion, action, or both. Cardiovascular disease is the most common cause of death and disability among people with diabetes. The cardiovascular disease that accompany diabetes include angina, myocardial infarction (heart attack), Stroke, peripheral artery disease and congestive heart failure. In people with diabetes, high blood pressure, high cholesterol, high blood glucose and other risk factors contribute to the increased risk of cardiovascular complications.

**Method:** This study was conducted to determine the cardiac complication in diabetic patient of rural India. It was Cross sectional retrospective study, done in between period of January 2018 to December 2019.

**Result:** In the present study authors found that 47.7% patients have Coronary artery disease (CAD), 21.6% have myocardial ischemia (SMI), 36% Diastolic dysfunction (DF), 28.8% have Systolic dysfunction (SDF).

**Conclusion:** In this study authors found that wide spectrum of cardiac complications in diabetic patients ranging silent myocardial ischemia to heart failure. CAD was the most common complication including silent myocardial ischemia (SMI) which is the one of the major concern of rural diabetic population which need proper screening by exercise treadmill test.

**Keywords:** Cardiology, Diabetes, Echocardiography, Rural population

### INTRODUCTION

Diabetes mellitus (DM) is a common endocrine disorder affecting approximately 382 million people worldwide.<sup>1</sup> Diabetes mellitus (DM) is group of metabolic disorder in which glucose is underutilized, thus producing hyperglycemia resulting from a defect in insulin secretion, action, or both. According to The Indian Council of Medical Research-Indian Diabetes Study (ICMR-INDIAB), currently India has 62.4 million people with DM.<sup>2</sup>

The majority (>90%) of them have Type 2 DM (T2DM).<sup>3</sup> The global prevalence of diabetes among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in

2014.<sup>4</sup> Diabetes prevalence has been rising more rapidly in middle- and low-income countries. Diabetes is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation.

Cardiovascular disease is the most common cause of death and disability among people with diabetes. The cardiovascular disease that accompany diabetes include angina, myocardial infarction (heart attack), stroke, peripheral artery disease and congestive heart failure. CVD is increased in individual with type1 or type 2 DM. The Framingham Heart Study revealed a marked increase in PAD, CAD, MI and CHF (risk increase from one -to fivefold) in diabetic population. In addition, the prognosis for individuals with diabetes who have coronary artery disease or MI is worse than for nondiabetics.<sup>5</sup>

Current study has been undertaken in view to assess the cardiovascular complications in rural India as they not only lack the proper medical center but also very negligent towards the health status of themselves.

Diabetes is still one of the stigma in Indian rural population; as they consider it as disease of riches. Current study is to focus on the cardiac complication in diabetic patient living in rural area.

Aim was to determine the cardiac complication in diabetic patient of rural India.

**METHODS**

It was Cross sectional retrospective study, done in between period of January 2018 to December 2019. A total number of 111 patients were enrolled for study and were examined physically and were evaluated after taking consent.

**Inclusion criteria**

- Patients diagnosed with DM within 5 year.
- Age between 18 and 55 years.

**Exclusion criteria**

- Prior history of any cardiovascular disease before diagnosis of diabetes.

**Procedure**

Cross sectional study was done on 100 eligible patient from OPD and Wards. Patient was evaluated by history examination and various investigations which helped in early recognition of cardiovascular risk in diabetic patient.

- 1-Through cardiovascular examination
- 2-ECG
- 3-X-chest
- 4-echo
- 5-cardiac biomarker
- 6-lipid profile
- 7-serum protein
- 8-TMT
- 9-blood sugar (fasting, post prandial).

**Criteria for the diagnosis of diabetes<sup>6</sup>**

FPG  $\geq$ 126 mg/dL (7.0 mmol/L). Fasting is defined as no caloric intake for at least 8 h.\* OR

2-h PG  $\geq$ 200 mg/dL (11.1mmol/L) during an OGTT. The test should be performed as described by the WHO, using a glucose load containing the equivalent of 75g anhydrous glucose dissolved in water.

OR A1C $\geq$ 6.5% (48 mmol/mol) OR

In a patient with classic symptoms of hyperglycaemia or hyperglycemic crisis, a random plasma. Glucose  $\geq$ 200 mg/dL (11.1 mmol/L).

\*In the absence of unequivocal hyperglycaemia, results should be confirmed by repeat testing.

**CAD**

CAD include stable angina, acute coronary syndrome (ACS), Sudden cardiac death and heart failure.

**RESULTS**

The study was conducted in the rural areas in and around the Rohilkhand Medical College, Department of Medicine for the duration of 2018 to 2019.

Diabetes is a major challenge for resource-limited countries like India. Majority of the patients are diagnosed late in the course of illness and usually with complications. Most of the rural population doesn't have access to quality healthcare facilities leading to a huge number of undiagnosed diabetics and inadequate evaluation and management of diagnosed diabetics.

In the present study we found that 47.7% patients have Coronary artery disease (CAD), Silent 21.6% have myocardial ischemia (SMI), 36% Diastolic dysfunction (DF), 28.8% have Systolic dysfunction (SDF).

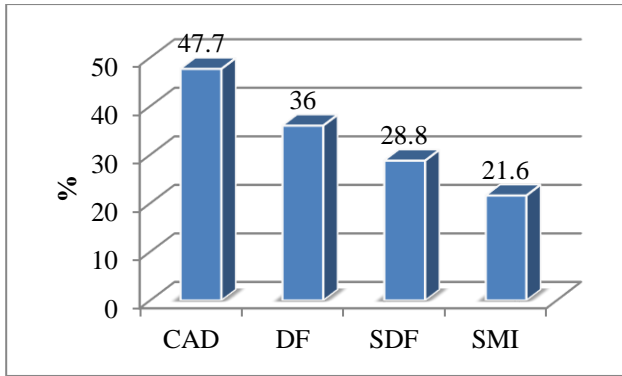
In this study coronary artery disease (CAD) present in 47.7% diabetic patients, out of these 21.6% diabetic population have silent myocardial ischemia (SMI) which constitutes 45.3% of CAD.

This study shows statistically significant association (p <0.01) between duration of diabetes mellitus and CAD and nearly significant/insignificant (p=0.05) with silent myocardial ischemia (SMI).

**Table 1: Distribution of patients according to age and gender.**

Age in years	Gender		Total	
	Male	Female	No.	%
<40	1	1	2	1.8
40-50	43	10	53	47.7
>50	32	24	56	50.5

Table 1 shows the distribution of patients according to age and gender. About half of patients were above 50 years (50.5%) followed by 40-50 (47.7%) and <40 (1.8%). More than half of males (56.6%) and 28.6% of females were 40-50 years of age.



**Figure 1: Prevalence of CAD, DF, SDF and SMI.**

Figure 1 shows the Prevalence of CAD, DF, SDF and SMI. CAD was present in 47.7% patients and DF was present in 36% patients. However, SDF and SMI were present in 28.8% and 21.6% patients respectively.

**Table 2: Distribution of CAD in male and female.**

Gender	n=53	
	No.	%
Male	43	81.1
Female	10	18.9

**Table 3: Distribution of SMI in male and female.**

Gender	n=24	
	No.	%
Male	22	91.7
Female	2	8.3

Table 2 shows the distribution of CAD in male and females. CAD was present among in 81.1% males and in 18.9% females.

Table 3 showing the classification of patients on basis of gender who had silent myocardial ischemia.

**Table 4: Comparison of duration of diabetes with silent myocardial ischemia (SMI).**

Duration of diabetes in years	No. of patients	SMI		p-value <sup>1</sup>
		No.	%	
<5	1	0	0.0	0.05
5-10	26	16	61.5	
>10	26	8	30.8	

<sup>1</sup>Chi-square test

Table 4 shows the comparison of duration of diabetes with SMI (CAD positive cases). SMI was present in 61.5% patients in whom CAD was present and duration

of diabetes was 5-10 years. The association was nearly significant (p=0.05).

Table 5 shows the comparison of duration of diabetes with DF. The percentage of DF was found to be higher with increasing duration of diabetes and the association was statistically significant (p=0.007). Table 6 and Figure 2 both shows the comparison of duration of diabetes with CAD. The percentage of CAD was found to be higher with increasing duration of diabetes and the association was statistically significant (p=0.01).

**Table 5: Comparison of duration of diabetes with diastolic dysfunction (DF).**

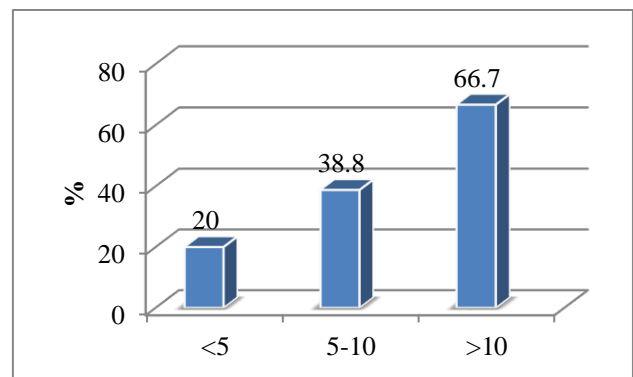
Duration of diabetes in years	No. of patients	DF		p-value <sup>1</sup>
		No.	%	
<5	5	0	0.0	0.007*
5-10	67	19	28.4	
>10	39	21	53.8	

<sup>1</sup>Chi-square test, \*Significant

**Table 6: Comparison of duration of diabetes with CAD.**

Duration of diabetes in years	No. of patients	CAD		p-value <sup>1</sup>
		No.	%	
<5	5	1	20.0	0.01*
5-10	67	26	38.8	
>10	39	26	66.7	

<sup>1</sup>Chi-square test, \*Significant



**Figure 2: Comparison of duration of diabetes with CAD.**

**DISCUSSION**

This study was conducted to determine the spectrum cardiac complications of diabetes mellitus population of rural India. The study was conducted in the rural areas in and around the by department of medicine for the duration of December 2018 to December 2019.

Diabetes is a major challenge for resource-limited countries like India. Majority of the patients are diagnosed late in the course of illness and usually with complications. Most of the rural population doesn't have access to quality healthcare facilities leading to a huge number of undiagnosed Diabetics and inadequate evaluation and management of diagnosed diabetics.

A total of 111 diabetic patients from rural areas around Rohilkhand medical college and hospital, were enrolled in the study. These patients were evaluated for cardiac complications in diabetes mellitus and comparison of complications with duration of diabetes mellitus, HBA1c.

In this study coronary artery disease (CAD) present in 47.7% diabetic patients, out of these 21.6% diabetic population have silent myocardial ischemia (SMI) which constitutes 45.3% of CAD (Figure 1).

A study conducted by Krishnan et al, in 2016 found that among 3.5% CAD patients of the entire study population 15% have DM.<sup>7</sup> In studies of Ramachandran et al, Bhatti et al, observed prevalence of CAD in diabetic patients were 11.4%, 18% respectively.<sup>8,9</sup>

Much higher prevalence of CAD in our study may due to changing lifestyles of rural population, late diagnosis of diabetes mellitus, poor glycemic control, lack of awareness and poor health facilities.

Both CAD and SMI more common in male than female in our study (Tab.3 and 4), this is probably due higher number of male in the study comparison to female and other associated risk factor like smoking and hypertension.

Our study shows statistically significant association ( $p < 0.01$ ) between duration of diabetes mellitus and CAD and nearly significant/insignificant ( $p=0.05$ ) with silent myocardial ischemia (SMI) (Table 4) (Table 6). In the Framingham Heart Study the risk of CHD was 1.83 times higher for each 10-year increase in diabetes duration (95% CI 1.18–2.83;  $P < 0.007$ ) (CI: Confidence Interval). The Framingham Heart Study reported a 1.38-fold increased risk for CAD and a 1.38-fold higher risk for cardiovascular death for each 10-year increase in diabetes duration.<sup>10</sup>

The second most common cardiac complication of our study is the diastolic dysfunction (DF). Diastolic dysfunction (DF) was found in 36% of patients in this study and (Figure 1). In our study we found 28.4% patients having diabetes for duration of 5 to 10 years develop diastolic dysfunction and 53.8% patient having diabetes for more than 10 years develop diastolic dysfunction showing strong association with increasing duration of diabetes mellitus ( $p < 0.007$ ) (Table 6). A study done by Patil et al, results showed that diastolic dysfunction was present in (54%) in diabetic populations comparing duration of diabetes of 6 to 10 years and 11 to

15 years with diastolic dysfunction, patients with 11 to 15 years duration of diabetes had more prevalence of diastolic dysfunction ( $p < 0.02$ ).<sup>11</sup>

The limitations of study were: Sample size was small and there is need of large sample size for further evaluation. Study applied to for only rural population and can not be generalized to whole population. Limitation of more intensive investigation like angiography, cardiac CT, cardiac MRI.

## CONCLUSION

In this study authors found that wide spectrum of cardiac complications in diabetic patients ranging silent myocardial ischemia to heart failure. CAD was the most common complication including silent myocardial ischemia (SMI) which is the one of the major concern of rural diabetic population which need proper screening by exercise treadmill test and angiographically in the resource limited rural areas and need further evaluation at higher cardiology centre. Diabetic cardiomyopathy is another most important complication in diabetic patients need echocardiographic (2D-ECHO) evaluation at regular interval. Diastolic dysfunction is the second most common complication followed by systolic dysfunction. As we found that significant correlation between these complications and increases with age, duration of diabetes, uncontrolled hyperglycemia assessed by HBA1c level, need early intervention and tight glycemic control to prevent these complications.

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