International Journal of Medicine Research
ISSN: 2455-7404; Impact Factor: RJIF 5.42
www.medicinesjournal.com
Volume 1; Issue 3; July 2016; Page No. 30-33

Coronary artery disease (CAD) in patients with type 2 diabetes mellitus and comparison with non-diabetic CAD patients

[1] Dr. Tarun Mishra, [2] Dr. Archana Ishwar, [3] Dr. Prabhat Pandey, [4] Ambrish Singh, [5] Dr. MP Chandrakar, [6] Dr. Sunil Pharmani

[1] DM Endo, City hospital, Raipur, Chhattisgarh, India
[2] DNB, Chandulal Chandrakar Hospital, Bhilai, Raipur, Chhattisgarh, India,
[3, 5] Department of Medicine, Chandulal Chandrakar Hospital, Bhilai, Raipur, Chhattisgarh, India
[4] Independent statistician and Medical Writer, MS Pharmacology and Toxicology, Bhopal, Madhya Pradesh, India
[6] Department of Medicine, MMI Hospital, Raipur Medical College, Raipur, Chhattisgarh, India

Abstract
Aims and objective: To compare the spectrum of clinical presentation, demographic variables, circadian variation, risk factor, complications of coronary artery disease (CAD) among patients with and without diabetes.
Materials and Methods: Present study was done on 120 CAD patients at Chandulal Chandrakar Memorial Hospital, Bhilai from Sep., 2010 to Sep., 2012 after dividing patients in to Group D (n=60, diabetic CAD) and Group ND (n=60, non-diabetic CAD). Detailed history of all patients along with echocardiography, systolic and diastolic dysfunction, complications and mortality was recorded in both the groups. Unpaired student t test and chi-square test was used wherever required. P value of less than 0.05 was considered as significant.
Results: The most common age group was 55-64 years (33.33%) and 45-54 years (41.66%) in Group D and Group ND respectively. Mean age of male and female was 56±8.7 years, 55±10.2 years and 56.6±9.7 years, 54.2±9.1 years in Group D and Group ND respectively. Most of the patient in Group D and Group ND were having diabetes duration of 1-3 years (36.67%) and 5-10 years (20%) respectively. Risk factors such as stage 1 hypertension (31.66% vs 20%), stage 2 hypertension (23.33% vs 16.66%), high triglyceride (21.68% vs 3.33%) and low HDL-C (35% vs 23.33%) were mostly present in Group D whereas Pre-hypertension (18.33% vs 46.67%) and high LDL-C (18.33% vs 25%) were commonly recorded in Group ND. The most common symptoms were chest pain (85% vs 81.66%) followed by excessive sweating (61.66% vs 48.43%) and vomiting (40% vs 21.71%). Diurnal variation in cardiac events was present throughout the day in Group D whereas it was mainly observed during second quarter of the day in Group ND. In presents study, in Group D and Group ND, 18 (30%) and 8 (13.33%) patients have expired respectively. The most common cause of mortality was pump failure (pulmonary edema/cardiogenic shock/both) followed by fatal ventricular arrhythmia.
Conclusion: Risk factors of CAD were more severe in patients with diabetes as compared to non-diabetes patients who were having CAD.

Keywords: diabetes mellitus, coronary artery disease, CAD, mortality

1. Introduction

According to latest diabetic Atlas released by International Diabetes Federation in 2015 reported that in a globe around 415 million people are living with diabetes and the number is expected to rise by 642 million by 2040. In India a total 69.2 million people are living with diabetes [1].

Coronary artery disease (CAD) is responsible for more than half of the death related to cardiovascular disease in both men and women who are age of <75 years [2].

According to the reports of Framingham study, it was shown that risk of cardiovascular mortality in men with diabetes is twice and four times in women with diabetes when compared to non-diabetic population [3]. Also risk of developing acute myocardial infarction is fifty percent more is diabetic men whereas risk is 150% more in women living with diabetes. Also CAD is broader i.e. become 2-3 vessel disease is patients with diabetes. Also chances of sudden death are 50% more in diabetes patient as compared to non-diabetic patient [4, 5].

Reports have shown that patients with metabolic syndrome are more susceptible for CAD, stroke and diabetes [6]. Insulin resistance is the culprit for the development of atherosclerosis, diabetes and CVD in patients with metabolic syndrome [7].

The present study was done to investigate different risk factors which are associated with CAD patients who are having diabetes.

2. Materials and Methods

The present prospective comparative study was done on 120 patients having CAD at CCM Hospital, Bhilai, and Chhattisgarh from November 2012 to November 2013.

All the patients were randomly divided into Group D (n=60, diabetes patients with CAD) and Group ND (n=60, non-diabetes patients CAD)

Patients with diabetes diagnosed as per the criteria defined by American Diabetes Association were included in Group D. Patients without diabetes but those presented with myocardial infarction or CAD and with reactive hyperglycemia with HbA1c <6.3% or blood sugar coming to normal in the absence of insulin or OHA on follow ups during the hospital stay were included. Non Q-M 1 patients were also included in our study with ST

depression and T inversion plus elevation in cardiac enzymes and typical chest pain.

Patients with fasting blood glucose <126 mg/dl, but >110 mg/dl, creatine kinase MB (CPK MB) at least four times of the upper limit of lab range and troponin t positive patients were excluded from the present study. Patients with ≥ 1 of following electrocardiographic changes; ST segment elevation of ≥ 2mm (0.08 sec), from J point in ≥ 2 related electric field with typical evolutionary changes and/or presence of new pathologic Q waves in ≥ 2 related electric fields (for Q-M.1.).

Blood pressure was categorized according to JNC-7 as optimal (<120, <80 mmHg), pre-hypertension (120-139, 80-89 mmHg), Stage 1 (140-159, 90-99 mmHg) and Stage 2 (>160, >100 mmHg). BP was measured with mercury BP apparatus and Phase V korokoff sound was taken as diastolic BP.

Patients was said to be smoker; if he/she regularly smokes ≥5 beedies/cigarettes per day and as ex-smoker; if he has left smoking ≥ 1 year.

Echocardiography was done with Ultramark-6 color Doppler echocardiography machine.

Following indices of dysfunction were observed:

- Systolic dysfunction; EF <50%, FS <26%, EPSS >7mm
- Diastolic dysfunction; A velocity >E, E/A ratio <1
- Prolonged IVRT (time between aortic value closure and mitral value opening) (>110 msec.)
- Prolonged deceleration time (DT) (>240 msec.)

Complications such as pump failure (LVF ± cardiogenic shock), rhythm disturbances (ventricular/artrial) and co-morbid complication such as stroke were also recorded.

In present study, 24 hours of a day is divided in to 4 quarters viz. I (0.00-6.00 AM), II (6.00 AM -12.00 Noon), III (12.00 Noon-6.00 PM) and IV (6.00 PM –midnight)

All the data was analysed using IBM SPSS ver. 20 software. Data are expressed as mean± standard deviation (SD). Unpaired student t test and chi-square test was used wherever required. P value of less than 0.05 was considered as significant.

3. Results

In present study most the patients in Group D were from the age group of 55-64 years [20 (33.33%)] whereas in Group ND most common age group was 45-54 years [25 (41.66%)]. There were 42 (70%) male and 18 (30%) female in Group D and 38 (63.33%) male and 22 (36.67%0 female in Group ND. Mean age of male and female was 56±8.7 years, 55±10.2 years and 56.6±9.7 years, 54.2±9.1 years in Group D and Group ND respectively.

Most of the patients in Group D were having diabetes duration of 1-3 years [22 (36.67%)] followed by 12 (20%) patients who had diabetes since 5-10 years (p>0.05). Mean duration of diabetes was 5.01±3.8 years. Mean duration of diabetes in male and female was 4.91±3.9 years and 5.11±3.2 years respectively (p>0.05).

In Group D, majority of the patients [29 (48.33%)] were taking oral hypoglycemic agents (OHA) only followed by 14 (23.33%) patients who were taking insulin or combination of insulin and OHA. In Group D [9 (34.62%)] and Group ND [6 (40%)], calcium channel blocker was mostly used as anti-hypertensive drug.

In Group D and Group ND, 26 (43.3%) and 15 (25%) patients were hypertensive by history respectively. Out of that, in Group D, 11 (61.11%) female and 15 (39.47%) male was hypertensive whereas in Group ND, 7 (18.42%) male and 7 (31.81%) female were hypertensive.

Mean BMI among male and female of Group D was 25.0±3.0 kg/m2 and 25.8±3.40 kg/m2 respectively whereas in Group ND mean BMI among male and female was 22.12±3.10 kg/m2 and 25.92±2.24 kg/m2 respectively (p<0.001;between male of both the groups, p>0.05; between female of both the groups).

Table 1: Distribution of patients according to different parameters

Parameter		Group D (n=60)	Group ND (n=60)	P Value
Symptoms	Chest pain	51 (85)	49 (81.66)	<0.001
	Abdomen pain	6 (10)	1 (1.67)	
	Breathlessness	12 (20)	5 (8.35)	
	Vomiting	24 (40)	13 (21.71)	
	Excessive sweating	37 (61.66)	29 (48.43)	
	Syncope	2 (1.66)	1 (1.67)	
	Palpitation	5 (8.3)	3 (5.01)	
Diurnal variation of cardiac events	First	12 (20)	5 (8.30)	<0.05
	Second	20 (33.33)	34 (56.66)	
	Third quarter	17 (28.33)	14 (23.33)	
	Fourth quarter	11 (18.34)	7 (11.71)	
CAD	Stable angina	33 (55)	40 (66.66)	<0.001
	Unstable angina	17(28.34)	12 (20)	
	MI	10 (16.66)	8 (13.34)	
Habit	Smoking	21 (35)	21 (35)	>0.05
	Tobacco chewing	5 (8.3)	2 (3.2)	
	Both	7 (11.66)	12 (20)	
BMI Variation	Overweight	15 (25)	15 (25)	>0.01
	Obese	23 (38.66)	8 (13.34)	<0.001
	Ideal	22 (36.66)	35 (58.45)	<0.001

Data is expressed as no of patients (%), CAD; coronary artery disease, BMI; body mass index, MI; myocardial infarction

Table 2: Showing different investigation between both the groups

Parameters		Group D			Group ND		
		Male (n=42)	Female (n=18)	Total	Male (n=38)	Female (n=22)	Total
W/H ratio	Normal	4 (9.52)	2 (11.11)	6 (10)	1 (2.63)	3 (13.63)	4 (6.67)
	High	38 (90.48)	16 (88.88)	54 (90)	37 (97.37)	19 (86.36)	56 (93.33)
Hypertension	Normal (<120/80)	13 (30.95)	3 (16.66)	16 (26.66)	8 (21.05)	2 (9.09)	10 (16.67)
	Pre-hypertension (120-139/80-89)	8 (19.04)	3 (16.66)	11 (18.33)	15 (39.47)	13 (59.09)	28 (46.67)
	Stage 1 (140-159/90-99)	12 (28.57)	5 (27.77)	19 (31.66)	9 (23.68)	3 (13.63)	12 (20)
	Stage 2 (≥160/≥100)	9 (21.42)	5 (27.77)	14 (23.33)	6 (15.78)	4 (18.18)	10 (16.66)
BP*	Systolic (mmHg)	139.5±25.2	132.1±26.3	135.8±25.3	125.32±24.2	124.4±21.2	124.9±22.4
	Diastolic (mmHg)	85.6±13.8	83.8±13.3	84.7±13.2	80.6±12.2	80.4±14.3	80.5±13.1
RBS#		252.42±93.81	247±87.26	249.7±92.6	127.69±61.2	122.76±46.21	125.2±52.3
Lipid abnormality	TC (>200 mg/dl)	4 (9.52)	4 (22.22)	8 (13.33)	3 (7.89)	5 (22.72)	8 (13.23)
	TG (>150 mg/dl)	8 (19.04)	5 (27.77)	13 (21.68)	2 (5.26)	0 (0)	2 (3.33)
	HDL-C (<40 md/dl)	12 (28.57)	9 (50)	21 (35)	9 (23.68)	5 (22.72)	14 (23.33)
	LDL-C (>100 mg/dl)	4 (9.52)	7 (38.88)	11 (18.33)	8 (21.05)	7 (31.81)	15 (25)
Cardiac function	Normal	6 (14.28)	2 (11.1)	8 (13.33)	12 (31.57)	5 (22.72)	17 (28.33)
	Abnormal	10 (23.80)	5 (27.77)	15 (25)	10 (26.31)	10 (45.45)	20 (33.33)
Systolic dysfunction	Mild	10 (23.80)	4 (22.22)	14 (23.5)	4 (10.52)	3 (13.63)	7 (11.66)
	Moderate	4 (9.52)	2 (11.1)	6 (10)	5 (13.15)	2 (9.09)	7 (11.66)
	Severe	4 (9.52)	1 (5.55)	5 (8.33)	2 (5.26)	0 (0)	2 (3.33)
Diastolic dysfunction		8 (19.04)	4 (22.22)	12 (20.04)	5 (13.15)	2 (9.09)	7 (11.65)

**P<0.01, # not significant (intra group male and female), W/H; waist: hip ratio, BP; blood pressure, RBS; random blood sugar, p value of<0.05 is considered as significant*

Mean fasting blood sugar in male and female of Group D was 172.6±54.7 mg/dl and 175.6±47.7 mg/dl and mean post prandial blood sugar level was 248.32±58.2 mg/dl and 237,92±46.2 mg/dl respectively (p>0.05). In Group D, 13 (21.7%) patients had good glycemic control, 31 (51.64%) had poor glycemic control.

In presents study, in Group D and Group ND, 18 (30%) and 8 (13.33%) patients have expired respectively (p<0.05).

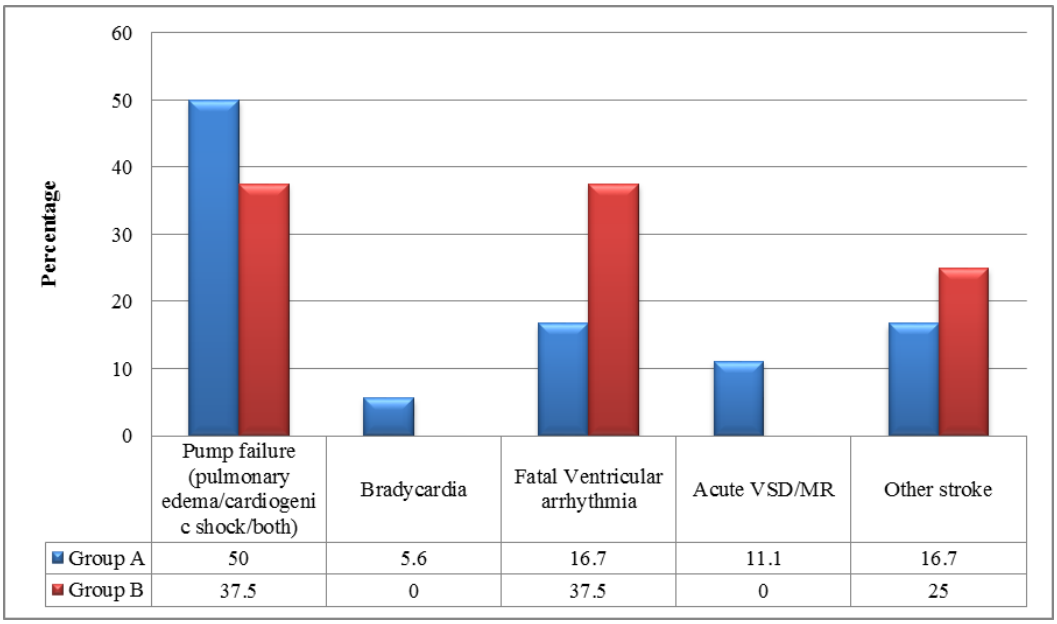

Fig 1: Causes of mortality in both groups

4. Discussion

CAD and silent ischemia are 2-4 times more common in patients with T2DM [8]. The chief reason of global mortality in diabetic patients is CAD as shown by different reports [6, 8].

The most common presenting symptom was chest paid followed by vomiting in Group D (85% and 40% respectively) and Group ND (81.66% and 21.71% respectively).

Among Group D patients' cardiac events occurred uniformly during the day without any diurnal variation, whereas in Group ND events reached the highest point in late morning. A similar study done by Pandey *et al* on 120 CAD patients also reported that cardiac events were recorded more in patients with diabetes as compared to non-diabetic CAD patients [9].

Wilsonm *et al* performed a similar study on 116 CAD patients and reported that patients with diabetes had greater frequency of intra-ventricular conduction defects and expressions of left ventricular dysfunction as observed by electrocardiography. But in present study non-diabetes patients were diagnosed more with

abnormal cardiac function mainly mild systolic dysfunction as compared to diabetic patients [10].

Dodani *et al* did a similar study on 213 first generation South Asian Immigrants among which 35 were diabetics and 178 were non-diabetic to compare the risk factors for CAD between both the groups. Dodani *et al* reported that risk factors such as hypertension and high cholesterol were significantly associated patients with diabetes. Also sub-clinical CAD was more common in diabetes group as compared to non- diabetes patients. In present study, most of the non-diabetic patients were pre hypertensive (46.67%) whereas stage 1 and stage 2 hypertension was mostly recorded in diabetes patients (31.66% and 23.33% respectively). Patients in Group D which comprises of diabetes patients were having higher systolic pressure. Also lipid abnormality such as high TG and low HDL-C were mostly recorded in diabetes patients of Group D whereas higher LDL-C was recorded in Group ND which is accordance with the Dodani *et al* [8].

Juutilainen *et al* performed a study on 1,059 diabetic patients to find out the role of diabetes in patient with coronary heart disease (CHD) reported that mortality rate was similar with both, in patients with diabetes and without diabetes ($p>0.05$). But in presents study, total 26 (21.66) patients expired; 30% in Group D and 13.33% Group ND ($p<0.05$) which was contrary to the study done by Juutilainen *et al*.[11] The most common reason for the mortality was pump failure (pulmonary edema/cardiogenic shock/both) followed by fatal ventricular arrhythmia.

5. Conclusion

In present study, CAD patients with diabetes have shown higher chances of severe risk factors such as hypertension mainly stage 1 and stage 2, high TG, low HDL-C level, systolic and diastolic dysfunction. We suggest an early diagnosis and required management to reduce above said risk factors which can lead to mortality.

6. References

1. International Diabetes Federation. Diabetes Atlus. 7th edition. 2015; 1-34.
2. Go AS, Mozaffarian D, Roger VL, Benjamin EJ, Berry JD, Borden WB *et al*. American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics update: a report from the American Heart Association. Circulation. 2013; 127:e6-e245.
3. Garcia MJ, McNamara PM, Gordon T, Kannel WB. Morbidity and mortality in diabetics in the Framingham population. Diabetes, 1974; 23:105-16.
4. Raheja BS. Heart disease in diabetes Aetiopathogenesis. J Association Physicians India. 1980; 28:81-90.
5. Sainani GS, Sainani Rajesh. Diabetes Mellitus and cardiobvascular disease. Current concepts in diabetes mellitus. 1993; 73:87-9.
6. Oldroyd JC, Yallop J, Fischbacher C, Bhopal R, Chamley J *et al*. Transient and persistent impaired glucose tolerance and progression to diabetes in South Asians and Europeans: new, large studies are a priority. Diabet Med. 2007; 24:98-9.
7. Fowler-Brown A, Pignone M, Pletcher M, Tice JA, Sutton SF. Exercise Tolerance Testing To Screen for Coronary Heart Disease: A Systematic Review for the Technical Support for the U.S. Preventive Services Task Force Ann Intern Med. 2004; 140:9-24.
8. Dodani S, Sharma G. Early Screening for Coronary Artery Disease is needed in South Asian Indian Immigrants with Type 2 Diabetes. Endocrinol Metabol Syndrome. 2011; S5:002
9. Pandey P, Chandrakar RK, Dobariya P, Namewar PK, Pandey P. A comparative study of coronary artery disease in diabetics and non-diabetics. Int J Res Med Sci. 2016; 4:2252-8.
10. Wilsonm CS, Gau GT, Fultonm RE, Davis GD. Coronary Artery Disease in Diabetic and Nondiabetic Patients: A Clinical and Angiographic Comparison. Clin. Cardiol. 1983; 6: 440-6.
11. Juutilainen A, Lehto S, R¨Onnemaa T, Py ¨Or¨Al¨A K. Laakso M. Type 2 Diabetes as a "Coronary Heart Disease Equivalent". Diabetes Care. 2005; 28:2901-7.