

Research Article

Profile of coronary artery disease cases in diabetics and non-diabetics: a comparative prospective study

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ABSTRACT

Background: Diabetes mellitus is one of the commonest disease worldwide ranking next to cardiovascular disorder. The estimated prevalence of diabetes among adults is expected to rise about 100% in future. Cardiac involvement in diabetes commonly manifests as CAD and less commonly as dilated (diabetic) cardiomyopathy and autonomic cardiovascular neuropathy. The risk of CAD among diabetic patients is directly related to the levels of blood pressure, cigarette smoking and total cholesterol.

Methods: The present study was undertaken at Chandulal Chandrakar memorial hospital, Bhilai, Chhattisgarh (India) between the periods of September 2010-2012 (2 years). 120 cases of CAD were studied, out of which 60 cases are diabetic CAD and 60 cases are non-diabetic CAD. Sample is drawn by simple random technique. Ethical approval was obtained from institutional ethical committee. Total Cases-120, Diabetic CAD [group – 1]-60 and Non-diabetic CAD [group – 2] – 60. On recruiting the subjects into Group 1 and Group 2 following protocol is followed-history, clinical examination, pt. stabilization, anthropometric measurement, routine investigations, specific investigations including echocardiography. Procedures, definitions and criteria were used in the study as per standard protocol. In the present study values are expressed as mean \pm 1 SD. Demographic characteristics of patient with or without diabetes and other unpaired variables were compared.

Results: Mean age in diabetic group was (55.7 ± 9.5) years while in non-diabetic group (55.6 ± 9.32) years. Diabetic group consists of 42 males and 18 females. Non Diabetic Group consists of 38 males and 22 females. Most of the patients in diabetic group presented with chest pain with sweating and with symptoms of sympathetic stimulation (vomiting/ apprehension 83.33%). A small fraction of diabetic patients presented with breathlessness – 20%, syncope (3.33%) and palpitation (8.3%). In diabetic group 55% of patients were hypertensive, pre-HTN was seen in 18.33% and 26.66% had optimal blood pressure. Non-diabetics have higher ideal body weight 58.33% than diabetic (36.66%). Among the diabetic group and non-diabetic group maximum number of cases belonged to low risk category with total cholesterol, triglycerides and LDL cholesterol, but with borderline risk with HDL cholesterol. Diabetics are more vulnerable to mortality than non-diabetics ($p < 0.05$).

Conclusions: Diabetics had considerably higher percent of typical and atypical presentation. Hence, CAD should be considered as one of the differential diagnoses in diabetics who have presented with chest pain, however less severe it may be.

Keywords: Coronary artery disease, Diabetes, Non-diabetics

INTRODUCTION

Diabetes mellitus is one of the commonest disease worldwide ranking next to cardiovascular disorder. The estimated prevalence of diabetes among adults is expected to rise about 100% in future. The correlation of a risk factor with development of diabetes is never 100%, but greater the risk factors present in an individual, the greater the chance of developing the diabetes mellitus. It is also called 'the disease of complications highlighting the higher mortality, morbidity and economic burden.

Type-2 diabetes accounts for over 95% of all diabetics in India. Due to its insidious onset and lack of alarming symptoms, the disease often remains undiagnosed for many years. Type-2 diabetes mellitus has significant relationship with obesity and almost 90% type-2 diabetics are obese although only minorities of obese people are diabetic. Research workers have blamed obesity and sedentary lifestyles are linked to each other and are responsible for the dramatic increase in type-2 diabetes over the past years.

Cardiac involvement in diabetes commonly manifests as coronary artery disease (CAD) and less commonly as dilated (diabetic) cardiomyopathy and autonomic cardiovascular neuropathy. Although CAD and diabetes mellitus have been recognized as distinct entities for many decades, who emphasized higher incidence and mortality of CAD among diabetics. It is estimated that, number of diabetics is going to be doubled by 2020 AD and CAD among them going to be tripled. It is going to manifest as "epidemic of diabetes and CAD" in developing countries, especially in India. Hence, it is going to put a mammoth burden on Indian economy and health, which has to be borne upon. Hence, one has to know about diabetes and CAD.¹⁻⁶

The Framingham heart study assessed that patient with diabetes; particularly women exhibited an increased risk in coronary events including angina, stroke, claudication, heart failure, myocardial infarction, and sudden death. The prevalence of CAD in Indians is higher than in any other population in the world. In the recent past, the prevalence has risen from 1.5-6.5% to 8-12%. There is difference in the prevalence of CAD in urban and rural India (8-9.6% to 3.5%) more common in south than north India. The incidence of CAD in diabetic men is twice and four times more common in diabetic woman. The risk of CAD among diabetic patients is directly related to the levels of blood pressure, cigarette smoking and total cholesterol.

Type-2 diabetes mellitus is the commonest type of diabetes in India. It gives rise to numerous complications, out of which coronary artery disease is important one, which is the leading cause of death in diabetes. As the trends keep on changing from time to time with respect to geographic region.^{7,8}

It is very vital to study the spectrum of clinical presentation, risk aggregation, complications, mortality and its causes among diabetic CAD Vs non-diabetic CAD. Hence, the study was undertaken.

METHODS

Source of data

The present study was undertaken at Chandulal Chandrakar memorial hospital, Bhilai, Chhattisgarh (India) between the periods of Sep- 2010 -2012 (2 years). 120 cases of CAD were studied, out of which 60 cases are diabetic CAD and 60 cases are non-diabetic CAD. Sample is drawn by simple random technique. Ethical approval was obtained from institutional ethical committee.

Sample size

Total Cases-120, Diabetic CAD [Group – 1]-60 and Non-diabetic CAD [Group – 2] – 60.

Inclusion criteria:

Group – 1 (Diabetic CAD): Previously known diabetic or first time detected diabetic by American diabetic association (ADA) criteria, 2007, presenting with CAD.

Group – 2 (Non-diabetic CAD):

1. Cases presenting with myocardial infarction who are not known diabetics or not fulfilling ADA criteria.
2. Cases presenting with CAD and with reactive hyperglycemia with glyco- Hb – 6.3% <(ADA Criteria) or blood sugar coming to normal in the absence of insulin or OHA on follow up, during hospital stay.

Exclusion criteria:

1. Patients having impaired Fasting Glucose [FPG <126 mg/dl. But >110 mg/dl, PP-PG 140 – 200 mg/dl] presenting with CAD.

On recruiting the subjects into Group 1 and Group 2 following protocol is followed- history, clinical examination, pt. stabilization, anthropometric measurement, routine investigations, specific investigations including echocardiography, procedures, definitions and criteria were used in the study as per standard protocol (JNC-7, American diabetic association (ADA) criteria and others).^{9,10}

In the present study values are expressed as mean \pm 1 standard deviation. Demographic characteristics of patient with or without diabetes and other unpaired variables were compared. Suitable statistical test was applied. In this study strength of association is said to be significant if $p \leq 0.05$.

RESULTS

The study consists of two groups i.e., diabetic CAD (group-1) and Non-diabetic CAD (group-2).

Table 1: Background characteristics of study subjects.

Variables	Diabetic (n1= 60)	Non Diabetic (n2= 60)
Age in year (Mean± SD)	55.7 ± 9.5	55.6 ± 9.32
Gender		
Male	42	38
Female	18	22

Table 2: Symptom analysis.

Symptoms	Diabetic		Non diabetic	
	No.	%	No.	%
Chest pain	51	83.33	49	81.66
Pain abdomen	6	10.00	1	1.60
Only	4	6.66	0	0.00
Associated chest pain	2	3.33	1	1.60
Breathlessness (±orthopnea ± PND ±Wheeze)	12	20.00	5	8.30
Only	3	5.00	1	1.60
Associated with chest pain	9	15.0	4	6.60
Vomiting	24	40.0	13	21.60
Alone	0	0.00	1	1.60
Associated with chest pain abdomen	3	5.00	0	0.00
Associated with breathlessness	1	1.60	0	0.00
Associated with chest pain	20	33.33	12	20.00
Excessive sweating	37	61.66	29	48.33
Alone	4	6.66	3	5.00
Associated with breathlessness	7	11.66	5	8.30
Associated with chest pain	24	46.0	20	33.33
Associated with pain abdomen	2	3.33	1	1.60
Syncope	2	3.33	1	1.60
Alone	2	3.33	0	0.00
Associated with breathlessness	0	0.00	1	1.60
Associated with chest pain	0	0.00	0	0.00
Palpitations	5	8.30	3	5.00

From table-1 and figure 1, it is recognised that mean age in diabetic group was (55.7 ± 9.5) years while in non diabetic group it was 55.6 ± 9.32) years. Diabetic Group

consists of 42 males and 18 females. Non diabetic Group consists of 38 males and 22 females.

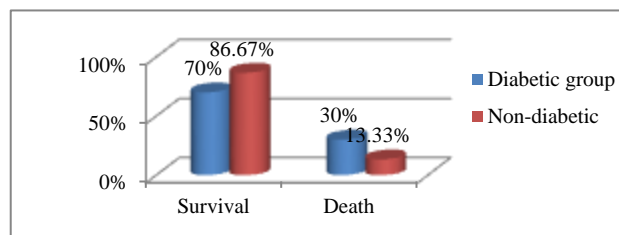


Figure 1: Mortality and survival pattern in two groups.

Table 2 exhibits that most of the patients in diabetic group presented with chest pain with sweating and with symptoms of sympathetic stimulation (vomiting/apprehension 83.33%). A small fraction of diabetic patients presented with breathlessness – 20%, syncope (3.33%) and palpitation (8.3%).

Table 3 shows that among diabetics, 61.11% of females were hypertensive and 35.71% of males were hypertensive by history. Among non-diabetics 18.42% of males were hypertensive and 31.81% of females were hypertensive. Among diabetic 26 (43.33%) are hypertensive and among non-diabetic 15 (25%) are hypertensive.

Table 4 indicates that in diabetic group 55% of patients were hypertensive, Pre-HTN was seen in 18.33 % and 26.66% had optimal blood pressure. In non-diabetic group, 36.66% of patients were hypertensive, pre-HTN was seen in 46.67% of pts and 16.67% had optimal blood pressure.

Table 5 explains, among diabetic and non-diabetics, calcium commonly used for the treatment of hypertension (34.62% and 40.00%).

Table 6 shows that significance was observed in smoking or tobacco chewing in both among male and female diabetics and non-diabetic patients.

From tables 7, 8 and 9 it is evident that diabetics are more obese than non-diabetics. Non-diabetics have higher ideal body weight 58.33% than diabetic (36.66%) ($p < 0.001$) whereas proportion of over-weight people was same in both groups. (Blood sugar Values are expressed in mg/dL±1SD). No significant association was found between RBS of diabetic male and female groups. Similar findings were found in the non-diabetic group also ($p > 0.05$).

Table 10 explains among the diabetic group and non-diabetic group maximum number of cases belonged to low risk category with total cholesterol, triglycerides and LDL cholesterol, but with borderline risk with HDL cholesterol.

Table 3: Hypertension history among diabetics and non-diabetics.

Group	<1 years			1-2 years			3-5 years			5-10 years			>10 years			Total
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	
Diabetic	2	0	2	4	2	6	4	4	6	7	4	11	0	1	1	26(43.3)
Non-diabetic	1	0	1	1	2	3	2	1	4	2	3	5	1	1	2	15(25.0)

Table 4: Hypertension categories in two groups.

	males	females	Total (%)	males	females	Total (%)
Optimal	13	3	16(26.66)	8	2	10(16.67)
Pre-HTN	8	3	11(18.33)	15	13	28(46.67)
HTN Stages						
Stage 1	12	7	19	9	3	12
Stage 2	9	5	14	6	4	10
	21	12	33(55)	15	7	22(36.66)

Table 5: History of treatment for hypertension among Diabetic and Non-diabetic.

Drugs	Diabetic		Non diabetic	
	No.	Percent	No.	Percent
β- blocker	6	23.08	3	20.00
Calcium channel blockers	9	34.62	6	40.00
ACE inhibitors	4	15.38	1	6.66
Diuretics	2	7.69	2	13.34
None	2	7.69	2	13.34
Not known	3	11.54	1	6.66

Table 6: Smoking or tobacco chewing in two groups.

	Diabetic			Non-diabetic		
	Male	Female	Total (%)	Male	Female	Total (%)
Smoking	21	0	21 (35.0)	21	0	21 (35)
Tobacco chewing	3	2	5 (8.3)	1	1	2 (3.2)
Both	7	0	7 (11.66)	12	0	12 (20.0)
Total	31	2	33 (55.0)	34	1	35 (58.3)

Table 7: BMI categories in males and females among diabetics.

Category	Ideal	Over-weight	Obese	Under nourished	Total
Males	17	11	14	00	42
Females	5	4	9	0	18
Total	22 (36.66%)	15 (25.00%)	23 (38.33%)	00 (0.0%)	60 (100.0%)

Table 8: BMI categories in males and females among non-diabetics.

Category	Ideal	Over-weight	Obese	Under nourished	Total
Males	24	08	5	01	38
Females	11	7	3	01	22
Total	35 (58.33%)	15 (25.0%)	8 (13.33%)	2 (3.33%)	60 (100%)

Table -9: Mean random blood sugar for both groups.

Group	Males	Females	Total
Diabetics	252.42±93.81	247±87.26	249.7±92.6
Non-diabetics	127.69±61.2	122.76±46.21	125.2±52.3
p>0.05			

Table -10: Lipid abnormalities among diabetic and non-diabetics.

Level of Risk	Total cholesterol		Triglyceride		HDL cholesterol		LDL cholesterol	
	Diabetic	Non Diabetic	Diabetic	Non Diabetic	Diabetic	Non Diabetic	Diabetic	Non Diabetic
High risk	8 (13.33)	8 (13.23)	13 (21.68)	2 (3.33)	21 (35.0)	14 (23.33)	11 (18.33)	15 (25.0)
Borderline	14 (23.33)	21 (35.0)	16 (26.66)	9 (15.0)	32 (53.33)	31 (51.66)	24 (40.0)	18 (30)
Low risk	37 (61.66)	38 (63.33)	31 (51.66)	49 (81.66)	7 (11.67)	15 (25.0)	25 (41.66)	27 (45)

DISCUSSION

Cardiovascular diseases including CAD are more common among diabetics than among non-diabetics. There are a lot of controversies regarding the clinical profile of CAD and the risk factors for CHD and mortality patterns are hotly debated. In this context we compared clinical, biochemical, electrocardiographic and clinical course of 60 diabetic CAD and 60-non diabetic CAD.

Symptoms on presentation

Chest pain was commonly found among diabetics (83.33%), 5% of patients in diabetic group had pain abdomen, 2/3rd of which never had associated chest pain and 5% had only breathlessness and 5% had only sweating, vomiting and giddiness.

In the Framingham study, with biennial ECG examination, out of 708 MI's which have appeared out of 5127 participants, more than 25% were discovered only ECG (unrecognized MI – 25%). Half of them had atypical symptoms and half of them were not having any symptoms at all “(actually / truly silent)”. Soler et al found that 33% of diabetics had atypical features and presented with heart failure, hyperglycemia, vomiting, collapse, confusion or CVA and were admitted in general wards, causing increase mortality (40%).^{11,12}

Risk factors among diabetic CAD's and non diabetic CAD's

In our study, among diabetic group 33 (55%) of the people were current smokers/tobacco chewers, 27 (45%) were non-smokers. Among non diabetics such figures were 35 (58.3%) and 25 (41.7%) respectively. In GUSTO-1 trial, 45% were current smokers, 26% were former smoker and 29% were never smoker among non

diabetics. Among diabetics, the same percentage was 31, 31 and 38 respectively. Hence, smoking is less commonly seen with diabetics. In the UKPDS, who participated in the trial, the same proportion was 32%, 46%, 22% in men and 29%, 27% and 44% among women. In the Rancho-Bernardo study 18.4% of men, 32.3% of women in diabetic group, 20.4% of men and 25.5% of women among non diabetics were currently smokers (23%) diabetics and 21% non diabetics). Smoking was commonly seen in females and mortality was also higher among them.¹³⁻¹⁵

Hypertension

When we consider the difference between the mean systolic and diastolic BP among 2 groups, we see that, systolic BP was higher among diabetics (P<0.01) and diastolic BP was also higher DM group (P<0.05). Same findings were seen among males and females. In the GUSTO-1 trial who have shown that systolic BP was higher among diabetics (P<0.001) and diastolic BP was equal (P=0.07) in two groups. In the Rancho Bernardo systolic BP (SBP) was higher in both sexes, more so in females.^{13,15}

Obesity

In our study, diabetics were in higher proportion of 'obese' and 'overweight' group according to BMI. Mean BMI for diabetics was higher than non diabetics 25.4 ± 3.1 and 24.02 ± 2.51. In both diabetic and non diabetic groups females were more obese than males. In GUSTO-1 trial BMI was higher among diabetics (28% Vs 26%, P<0.001). In the study conducted by Marie Seibaek involving diabetics and non diabetics who were referred to coronary angiography, BMI was slightly higher among diabetics but was not statistically significant.

In the Rancho Bernardo study, though BMI was high among diabetics, males commonly had higher BMI than females unlike our study.¹³⁻¹⁶

Diabetic dyslipidemia

Diabetics had higher TG, low HDL and low LDL as compared to non diabetics in the current study. Koskinen. P et al in the Helsinki Heart trial has noted that compared to non diabetic subjects, NIDDM patients had lower HDL cholesterol and higher TG concentration, which is consistent with our findings, such dyslipidemia was translated into increased mortality (7.4 vs 3.4%) and by treating this with gemfibrozil, mortality was reduced. Fontbonne A et al in the Paris prospective study was noted that, an increased serum TG level in non diabetics was directly related to mortality in multivariate analysis. Rancho Bernardo study also noted similar findings and noted that dyslipidemia was more commonly seen in women and hence, mortality was higher among women in the study.^{15,17,18}

In hospital mortality

In our study we noted 18 (30%) mortality among diabetics compared to 8 (13.33%) among non diabetics. The association was found to be statistically significant ($P < 0.05$).

CONCLUSIONS

Diabetics had considerably higher percent of typical and atypical presentation. Hence, CAD should be considered as one of the differential diagnoses in diabetics who have presented with chest pain, however less severe it may be. Diabetics have a higher risk factor profile and poor clinical outcome and hence they should be observed keenly for complications and especially to be looked for pump failure. Treating such complication vigorously will reduce the mortality among diabetics with CAD.

Limitation of the study

1. Study Sample: Due to the time constraints only 60 Diabetic and 60 Non diabetics were studied.
2. Management of CAD has not been studied, which requires further research.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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