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Research Article

A comparative study of coronary artery disease in diabetics and non-diabetics

Prabhat Pandey[1]*, Rajendra Kumar Chandrakar[2], Prashant Dobariya[1], Pavan Kumar Namewar[1], Pooja Pandey[3]

[1]Department of Medicine, CM Medical College, Durg, Chhattisgarh, India
[2]Department of Pathology, CM Medical College, Durg, Chhattisgarh, India
[3]Department of Dermatology, AIIMS, Raipur, Chhattisgarh, India

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***Correspondence:**
Dr. Prabhat Pandey,
E-mail: pndyprabhat@yahoo.co.in

ABSTRACT

Background: Cardiovascular diseases accounts for the greatest burden of morbidity and mortality worldwide, both in developed and in developing countries. Coronary Heart Disease makes up more than half of all CVD deaths in men and women under 75 years of age, is eases with a lifetime risk of developing CHD after age 40 years, of 49 per cent for men and 32 per cent for women. The Framingham study showed that the risk of cardiovascular death was increased 4-5 fold in women and 2 fold in men with predominantly type-2 diabetes mellitus.
Methods: The present study was undertaken at Chandulal Chandrakar Memorial Hospital, Bhilai, Dist. Durg, Chhattisgarh, India between the periods of September- 2010, September-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 were 120, Diabetic CAD (Group -1)-60 and Non-diabetic CAD (Group 2)-60.
Results: Male to female ratio in group-1 was 2.3:1 and in group-2 it was 1.7:1. Females were commonly affected in the diabetic group than non-diabetic group. 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. 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.
Conclusions: CAD in diabetics had considerably higher percent of severe and unpredictable presentation. Diabetics have a higher risk factor profile and poor clinical outcome.

Key words: Coronary artery disease, Diabetes, Non-diabetics

INTRODUCTION

Cardiovascular diseases accounts for the greatest burden of morbidity and mortality worldwide, both in developed and in developing countries. Key cardiovascular risk factors, including hypertension, cigarette smoking, high blood glucose, physical inactivity, obesity, and elevated cholesterol are the top leading causes of death worldwide.[1] Coronary heart disease makes up more than half of all CVD deaths in men and women under 75 years of age, is eases with a lifetime risk of developing CHD after age 40 years, of 49 per cent for men and 32 per cent for women (Go AS et al.).[2]

The worldwide prevalence of diabetes has mellitus has risen dramatically over the past two decades, from an estimated 30 million cases in 1985 to 177 million in 2000.[3] In the US, the centre for disease control and prevention (CDC) estimated that 20.8 million persons or around 7% of population is having diabetes in 2005 and

around 30% of individuals with diabetes were undiagnosed. It was estimated that there were around 28 million Indians who were diabetic in 1994 and around 2% of rural and 5.7% of urban population had diabetes then.[4]

Diabetes and dyslipidemia are independently major risk factors in macrovascular disease but when they occur together the risk is significantly increased and adverse effects of diabetes on serum lipids are more pronounced than in normal subjects.

Dyslipidemia is observed in practically all patients of type-2 diabetes mellitus and every high level of cholesterol in diabetics has 2-3 times higher CAD risk than non-diabetic individuals.

The Framingham study showed that the risk of cardiovascular death was increased 4-5 fold in women and 2 fold in men with predominantly type-2 diabetes mellitus. 75 to 80% of adult diabetic patients die from coronary artery disease, cerebrovascular accidents and or peripheral vascular disease.

Coronary artery disease mortality is higher amongst Indian Asians than in other ethnic groups. It is predicted that cardiovascular mortality will rise by 100% in India by the year 2015. New risk factors for CAD among diabetics viz microalbuminuria, PAI – 1 And hyper-(pro)-Insulinaemia have appeared, which have to be kept in mind while treating CAD because PAI–1 may pose resistance to thrombolysis.[5-7]

It is very vital to study the various determinants of CAD among diabetic and non- diabetic cases. Hence, the study was undertaken.

METHODS

The present study was undertaken at Chandulal Chandrakar Memorial Hospital, Bhilai, Chhattisgarh, India between the periods of September- 2010, September-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. For the study a total of 120 cases were taken, 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.[9]

Group – 2 (Non-diabetic CAD).

- Cases presenting with myocardial infarction who are not known diabetics or not fulfilling ADA criteria.
- 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

Patients having impaired fasting glucose level presenting with CAD. (FPG<126mg/dl But>110 mg/dl, PP-PG 140-200mg/dl)

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).[8,9]

In the present study values are expressed as mean ±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 $p < 0.05$.

RESULTS

The study consists of two groups i.e. Diabetic CAD (group-1) and Non- diabetic CAD (group-2). Group-1 consists of 60 cases (42 males and 18 females) and group-2 consists of 60 cases (38 males and 22 females). Age difference between two groups and within groups among sex wise, t-test shows insignificant $p>0.05$.

Male to female ratio in group-1 was 2.3:1 and in group-2 it was 1.7:1. Females were commonly affected in the diabetic group than non-diabetic group ($p<0.01$). Only 4 premenopausal women had CAD among diabetic group whereas none were in premenopausal group among non-diabetics (Table 1).

24 hours of a day is divided into 4-quarters: I- 0.00 – 6.00 AM II-6.00 AM – 12.00 Noon III-12.00 Noon – 6.00 PM IV-6.00 PM – midnight.

The onset of symptoms was noted corresponding to the particular quarter to know the diurnal variation in the onset of symptoms. There is significant difference in time of onset of symptoms among diabetics and non-diabetic cases. From this it is clear that, among diabetic group events occurred uniformly throughout the day without any diurnal variation, whereas the same in non- diabetics, there is peaking of events in late morning (6.00 AM to 12.00 Noon) following the circadian rhythm of cardiac events (Table 2).

Maximum number of cases of Stable angina belonged to Non Diabetic group (66.66%) and unstable angina and MI belonged to Diabetic group (28.34% and 16.66%) respectively. There was a significant association between types of CAD among the diabetic and the non-diabetic groups (P<0.001) (Table 3).

Table 1: Age and sex wise distribution of diabetic and non- diabetic case with CAD.

Age group (years)	Diabetic			Non-diabetic			Total
	Male	Female	Total	Male	Female	Total	
35-44	2	2	4	3	1	4	8
45-54	14	5	19	15	10	25	44
55-64	14	6	20	9	6	15	35
65-74	7	3	10	7	4	11	21
75 and above	5	2	7	4	1	5	12
Total	42	18	60	38	22	60	120
Mean±SD	56±8.7	55±10.2	56.6±9.5	56.6±9.7	54.29.1	55.6±9.32	-
'P' value	NS	NS	NS	NS	NS	NS	-

Table 2: Diabetic variation of cardiac events.

Quarter	Diabetic		Non Diabetic	
	No.	Percent	No.	Percent
First	12	20.00	5	8.30
Second	20	33.33	34	56.66
Third Quarter	17	28.33	14	23.33
Fourth Quarter	11	18.34	7	11.71
Total	60	100.00	60	100.00

X^2 value-7.89, p value-<0.05

Total 3: Distribution of CAD according to their types.

CAD	Diabetic		Non diabetic	
	No.	Percent	No.	Percent
Stable angina	33	55.00	40	66.66
Unstable angina	17	28.37	12	20.00
Myocardial Infarction	10	16.66	8	13.34
Total	60	100.00	60	100.00

X2 value-37.5, p value-<0.001

Table 4: Duration of diabetes among established diabetics.

Duration (years)	Diabetic	
	Number	Percent
Less than 1 year	6	12.00
1-3	22	44.00
3-5	8	16.00
5-10	12	24.00
More then10	2	4.00

p value- >0.05

Among the established diabetics, mean duration of diabetes was 5.01±3.8 years (1 SD). For males mean duration of diabetes was 4.91±3.9 years (1 SD) and for female it was 5.11±3.2 years (1 SD). The association between Males and Females in relation to duration of diabetes among established diabetic is insignificant (P>0.05) (Table 4).

Table 5: Treatment among known diabetics.

Treatment	Number of cases	%
OHA	29	58
Insulin or Insulin+ Diet control	8	15
Diet control alone	2	4
OHA+ Insulin	6	12
OHA+Diet	2	4
None	3	6

Among known diabetics, majority were taking oral hypoglycemic agents (OHA). 27% of known diabetics were taking insulin or combination of insulin and OHA (Table 5).

Table 6: Mean blood Pressure among diabetic and Non-diabetic.

Mean (mm Hg±1SD)	Diabetics		Non-Diabetics	
	Systolic	Diastolic	Systolic	Diastolic
Total	135.8±25.3	84.7±13.2	124.9±22.4	80.5±13.1
Males	139.5± 25.2	85.6± 13.8	125.32± 24.2	80.6 ±12.2
Females	132.1± 26.3	83.8 ±13.3	124.4 ±21.2	80.4± 14.3

Table 7: Statistical significance of BMI variation among diabetic and Non-diabetic.

BMI	Diabetics	Non-diabetics	P value
Overweight	15	15	>0.01 Not Significant
Obese	23	8	<0.001 Highly significant
Ideal	22	35	<0.001 Highly significant

Both Diabetic group and non-diabetic group had higher systolic blood pressure ($p<0.01$) and higher diastolic blood pressure ($p<0.05$) (Table 6).

Table 8: Mean BMI among diabetic and Non-diabetic.

Variable	Diabetics	Non-diabetics
Mean BMI (±SD)	25.4±3.10	24.02±2.51

Table 9: Waist Hip Ratio among diabetic and Non-diabetic.

Waist/Hip Ratio	Diabetics	Non-diabetics
Normal	6 (10%)	4 (6.67%)
High	54 (90%)	56 (93.33%)

$p>0.05$

Table 10: Glycemic control among males and females in Group 1.

Control	Males		Females		Total	
	Number	Percent	Number	Percent	Number	Percent
Good	10	23.81	3	16.00	13	21.70
Fair	12	28.57	4	22.22	16	26.66
Poor	20	47.62	11	61.78	31	51.64
Total	42	100.00	18	100.00	60	100.00

Table 11: Lipid abnormalities among diabetics and non-diabetics.

Level	Diabetics							
	Total cholesterol		Triglyceride		HDL cholesterol		LDL cholesterol	
	M	F	M	F	M	F	M	F
High	4	4	8	5	12	9	4	7
Borderline	9	5	10	6	27	5	16	8
Low risk	28	9	24	7	3	4	22	3
Non-diabetics								
High	3	5	2	0	9	5	8	7
Borderline	13	8	4	5	22	9	11	7
Low risk	29	9	32	17	7	8	19	8

From this it is clear 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 proportions of over-weight people were same in both groups (Table 7).

Mean BMI values were mentioned in Table-8. There was no significant association between waist:hip ratio among diabetic and non- diabetic groups (Table 8, 9).

It is obvious that there was no much difference between Glycemic control among males and females. In the diabetic group 21.7% had good control, 26.66% had fair control and 51.64% had poor control of blood sugar on presentation (Table 10).

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.

There is a significant association between microalbuminuria and diabetic retinopathy. Systolic dysfunction is commonly found in diabetics than non-diabetics (41.66% vs. 26.66%) (Table 11-13).

Table 12: Diabetic retinopathy correlated with micro albuminuria.

Micro albuminuria	Diabetic retinopathy		'P' values
	Present	Absent	
Present	16	12	P<0.005
Absent	5	27	
Total	21	39	60

Table 13: Cardiac function as assessed by echocardiography.

Cardiac function	Diabetic			Non-diabetic		
	Male	Female	Total (%)	Male	Female	Total (%)
Systolic and Diastolic function normal	6	2	8 (13.33)	12	5	17 (28.33)
Both systolic and diastolic dysfunction Present	10	5	15 (25.0)	10	10	20 (33.33)
Systolic dysfunction only						
Mild	10	4	14 (23.3)	4	3	7 (11.66)
Moderate	4	2	6 (10)	5	2	7 (11.66)
Severe	4	1	5 (8.33)	2	0	2 (3.33)
Diastolic dysfunction only	8	4	12 (20.04)	5	2	7 (11.65)

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.

In present study, there was no significance difference between age in two groups (Diabetic and non-diabetic) P>0.05. Age difference between two groups and within groups among sex wise and list shows insignificance (P>0.05).

Singer DE observed that, diabetic were older and noted that females are commonly involved, which agrees with our study. There was no much difference, in the involvement of younger age group (<40 years) (1.67%, 2%, P-NS). When age wise cut-off is seen, maximum events occurred in 50-59 years in both diabetics and non-diabetics. Hence, age is an important risk factor for CHD in non-diabetic and diabetic population alike.[5]

In the GUSTO-1 trial, when diabetics were considered, it was seen that, diabetic MI patients were older compared to non-diabetic MI's. But such results were not obtained in our study. GUSTO-1 trial says that females are commonly involved in diabetic group, which was consistent with our results.[10]

According to a study conducted by Viberti GC, et al, increment in BP is more commonly seen when nephropathy sets in, than when it is absent (P<0.02) such increment were seen for both systolic and diastolic BP. We could not study such change because of small number of patients who developed nephropathy.[11]

In UKPDS trial, though BMI among diabetics was higher, it did not translate into increased coronary events and lost its significance as risk factor for the development of CAD. In the study conducted by Laakso M, et al in

Finland, BMI was higher in women than men that corroborate with our study.[12,13]

Waist-hip ration is a measure of central obesity. It is known by Indian studies and Indian migrant studies that, increased W:H ratio and thus central obesity is very common among diabetic people of Indian origin and acts as a risk factor for CAD, even in the absence of other risk factors.[8,14-16]

In present study, central obesity was present in 38 (90.48%) of males and 16 (88.88%) of females in diabetic group and 27 (97.37%) of males and 19 (86.36%) of females in non-diabetic group. Insignificant association was noted between W: H ratio and the Diabetic and the non-diabetic groups (P>0.05).

In the study conducted by McKeigue PM et al involving South Asian migrants in UK, it was found that, South Asian migrants had higher mean W: H ratios, which correlated with increased blood pressure and higher TG levels as compared to British population. Hence, they concluded that, such higher incidence of central obesity resulted in diabetes and coronary artery disease.[17]

In the study conducted by Seibaek M et al, the mean W: H ratio among diabetics and non-diabetics were 0.98±0.01 and 0.96±0.01 respectively. But such difference was not statistically significant. It may be because that, the study utilized newly diagnosed diabetics (i.e. diagnosed to be diabetic, during angiography).[18]

In UKPDS, the W:H ration for men and women was respectively 0.95±0.06 and 0.87±0.08. But again such central obesity was not translated to cardiac events on follow up. Hence, presence of central obesity is an important risk factor for people of Indian origin than Western people.[12]

In present study it was noted that 25 (41.66%) of diabetics had systolic dysfunction only whereas only 16 (26.66%) of non-diabetic had it. But when we consider presence of both systolic and diastolic dysfunction together, it was found in 15 (25%) of diabetic and 20 (33.33%) of non-diabetics Isolated systolic dysfunction is commonly noted among diabetics. And when we see mean ejection fraction, fractional shortening, it is found that, both are low in diabetics. In the study conducted by Kouvaras G et al in Japan, it was found that, indices of myocardial contractility i.e., EPSS. EF and FS were far more impaired in diabetics MI's than non-diabetic MI's. No significant difference was found in the prevalence of dyskinetic, akinetic and hypokinetic segments between 2 categories of patients, suggesting no difference in the amount of myocardial mass affected in AMI. Similar observations were obtained in our study also, and there was no much difference between wall motion abnormalities among diabetics and non-diabetics.

According to Seibaek M, et al, EF was similar among diabetics and non- diabetics. Few more studies have also shown a significant relationship between diabetes with reduces myocardial reserve in significant.[18-21] Presence of cardiomyopathy in the presence of MI is significant because, it reduces myocardial reserve and hence patients are more prone for LVF, more so females

CONCLUSION

CAD in diabetics had considerably higher percent of severe and unpredictable presentation. Diabetics have a higher risk factor profile and poor clinical outcome. Early diagnosis and appropriate management will reduce the risk of complication after the onset of disease.

Limitation of the study

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

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