Original Research Article

Study of effect of diabetes mellitus on classical risk factors for coronary artery disease

Suchitra Garhwal[1]*, Anil Kumar Poonia[2], Veeha Agarwal[3]

[1]Department of Medicine, ESIC Model Hospital, Jaipur, Rajasthan, India
[2]Department of Pediatrics, SDMH, Jaipur, Rajasthan, India
[3]Department of Pathology, HCG Hospital, Ahmedabad, Rajasthan, India

*Correspondence:
Dr. Suchitra Garhwal,
E-mail: suchitra.garhwal@gmail.com

ABSTRACT

Background: Diabetes mellitus (DM) is increasingly prevalent in general population and is associated with increased risk for coronary artery disease (CAD). DM both directly and indirectly increases risk of CAD. Quantum of DM associated increase in classical risk factor for CAD is not exactly described. In present study, association of traditional risk for CAD and DM was analyzed.
Methods: Total 150 patients with CAD were enrolled and divided into two group: group 1 with DM (84 patients) and group 2 without DM (66 patients). These two were compared and analyzed for classical risk factors for DM.
Results: CAD with DM group had higher prevalence for traditional risk for CAD than CAD alone group: for Hypertension relative prevalence was 67.8 and 36.3% respectively (p<0.05); for Obesity it was 79.7 and 40.9% respectively (p<0.05) and for Dyslipidemia relative prevalence was 75 and 37.8% respectively (p<0.05).
Conclusions: DM is major risk for CAD and it is also associated with increased prevalence for hypertension, obesity and dyslipidemia in affected population.

Keywords: DM, CAD, Hypertension, Obesity, Dyslipidemia

INTRODUCTION

According to international diabetes federation (IDF), around 8.8% of world population is diabetic while majority of them are having type 2 DM (T2DM) and incidence rate of T2DM has increased by 83.3% over last three decades and males are more affected than females.[1,2] Diabetes mellitus is a major risk factor for CAD, and vice versa cardiovascular disease (CVD) is a major cause of mortality among this group.[1,4] In a study, cardiovascular causes related mortality in T2DM with and without prior history of ischemic heart disease was 42 and 15.4% respectively, while in non-diabetic patients' similar relative prevalence of mortality was 15.9 and 2.1%, respectively.[4]

Diabetes induced vasculopathy increases incidence of CAD and stroke by 2 to 4 fold.[5] Proposed mechanisms for vascular dysfunction in DM are related with hyperglycemia, visceral adiposity, insulin resistance (IR) and variation in various circulating factors level.[6] Oxidative stress promotes atherogenesis, which occurs due to antioxidant deficiencies, increased production of reactive oxygen species and the process of glycation and glyco-oxidation.[7] Besides increased incidence of clinically significant cardiovascular events, subclinical CAD occurs frequently in T2DM, where diabetic autonomic neuropathy which may attenuate ischemia awareness and hence leads to increased risk of cardiovascular mortality.[8] Coexistence of hypertension, obesity and dyslipidemia with diabetes further contributes to the increased prevalence of CVD in diabetic patients.[9-

[11] A population study conducted in urban south India by diabetes research centre shows that there was a high prevalence of the clustering of cardiovascular risk factors, namely central adiposity, obesity, hyperinsulinemia, dyslipidaemia, hypertension and glucose intolerance in the adult aged more than 40 years.[12]

In this study, association of classical risk factors for CAD with diabetes mellitus was analyzed in CAD patients with T2DM.

METHODS

In this case control study 150 patients, admitted with CAD at tertiary care level hospital in Jamnagar India from July 2016 to July 2017, were enrolled and further divided in two groups based on presence and absence of DM. Group one included 84 patients with CAD having DM while group two included 66 patients having CAD without DM. They were screened for hypertension, obesity and dyslipidemia. Details of major cardiovascular risk factors such as smoking, alcohol intake, and amount of physical activity, diabetes and hypertension were inquired.

A twelve lead ECG was taken daily till ICCU stay of patient. On admission fasting blood samples were taken for estimation of total cholesterol, low density cholesterol, high density cholesterol and triglyceride level using standardized techniques.

Patient is defined as diabetic if fasting blood sugar (FBS) is >126 mg/dl or postprandial blood sugar (PPBS) >200 mg/dl, HbA1C >6.5% or on antidiabetic medication. Hypertension was defined as systolic BP (SBP) ≥140 mmHg and/or diastolic blood pressure (DBP) ≥90 mmHg and on antihypertensive treatment. Dyslipidemia if they met any of following criteria: LDL-cholesterol ≥160 mg/dL, HDL-cholesterol <40 mg/dL, triglycerides ≥200 mg/dL, or use of lipid lowering medication.[13]

Statistical analysis was performed by using chi square test and student t test was applied to see the difference in mean values of a quantitative data.

RESULTS

Total 150 patients with CAD were enrolled in this study, out of which 84 patients had diabetes. Based on presence of DM, two groups were formed and compared for baseline characteristics and other traditional risk factors for CAD.

Age and sex distribution between two groups was statistically not significant. When comparing lifestyle, alcohol and tobacco consumption, difference between two groups was statistically not significant, but smoking habit was more prevalent in CAD with DM group compare to the CAD alone group (p value<0.05) (Table 1).

Analysis of other traditional risk factors for CAD in study population revealed CAD patient with DM had higher prevalence of hypertension, obesity and dyslipidemia compare to the CAD alone group (p value<0.05) (Table 2).

Patients of CAD with DM had higher mean fasting blood sugar value as well as PPBS in compare to CAD only group (p<0.05). Similarly, patient's CAD with DM had higher systolic and diastolic blood pressure compare to CAD patients without DM (p value for SBP and DBP is <0.020 and <0.002 respectively). Average BMI and waist circumference were also higher in CAD with DM group than CAD alone group (p<0.05). In this study CAD with DM group had higher LDL (p value of 0.003), lower HDL value (p<0.001) than CAD alone group. Although cholesterol was also higher in CAD with DM group but it was statistically not significant (Table 3).

Table 1: Baseline characteristics and traditional risk factor comparison.

Variables	CAD with DM (n=84)	CAD alone (n=66)	P value	Significance
Age (Year)	56.21±8.93	57.43±10.90	0.452	NS
Sex: Male	57	41	0.493	NS
Female	27	25		
Sedentary life	54	44	0.863	NS
Alcohol	3	1	0.63	NS
Tobacco	27	28	0.233	NS
Smoking	56	12	0.0001	S

Table 2: Prevalence of obesity, dyslipidaemia and hypertension.

Variables	CAD with DM (n=84)	CAD alone (n=66)	P value	Significance
Hypertension	57 (67.8)	24 (36.3)	0.0001	S
Obesity	67 (79.7)	27 (40.9)	0.0001	S
Dyslipidemia	63 (75)	25 (37.8)	0.0001	S

Table 3: Comparison of metabolic profile between two groups.

Variables	CAD with DM (n=84)	CAD alone (n=66)	P value	Significance
FBS (mg/dl)	176.15±36.53	95.34±10.36	0.0001	S
PPBS (mg/dl)	249.95±42.7	135.10±18.62	0.0001	S
SBP (mmHg)	141.38±22.82	129.30±23.95	0.0020	S
DBP (mmHg)	86.71±12.40	82.09±11.50	0.020	S
HDL (mg/dl)	46.91±9.36	51.27±8.2	0.003	S
Waist to hip ratio	0.98±0.15	0.88±0.11	0.0001	S
LDL (mg/dl)	107.94±17.77	97.44±20.77	0.0011	S
Cholesterol (mg/dl)	174.19±42.9	170.92±35	0.616	NS
BMI (kg/m^2)	25.71±2.40	24.72±2.27	0.011	S
WC (cm)	89.85±6.32	85.78±6.22	0.0001	S

DISCUSSION

In this study, we studied association of classical risk factors for coronary artery disease and diabetes mellitus. Dyslipidemia, hypertension and obesity are classical risk factors for CAD, but their quantification of association with diabetes mellitus is sometime difficult to establish.

In our study we compared dyslipidemia, hypertension and obesity prevalence in CAD patients with or without T2DM. In large case studies, a causal association was found between elevated triglyceride level, low HDL and cardiovascular disease.[14,15] In T2DM dyslipidemia is increased as insulin resistance increases free fatty acids level by increasing their mobilization from adipose tissue. Moreover, very low-density lipoproteins hepatic production increased as a result of increased lipogenesis, augmented substrate availability, and attenuated apolipoprotein B-100 removal. Following these effects of T2DM on lipid profile, there is resulting low HDL-C, high LDL and triglyceride levels.[16] In our study, dyslipidemia was statistically significantly higher in T2DM group compared to non T2DM group featured as low HDL, high LDL and high cholesterol (p<0.05).

In T2DM incidence of hypertension increased (60%) following increased activity of rennin angiotensin aldosterone system, sympathetic tone and renal sodium absorption.[17,18] Hypertension increases risk of CAD by fourfold in T2DM patients.[19] Similarly we found high prevalence of hypertension in CAD patients having T2DM compared to non-diabetic patients (p<0.05).

Obesity increases CAD risk as it promotes atherogenesis and associated with procoagulant and prothrombotic cardiovascular risk factors in T2DM patients.[20-24] Prevalence of obesity was higher in CAD patient with T2DM than in normoglycemic patients in our study as evidenced by elevated waist to hip ratio, waist circumference and BMI in diabetic group (p<0.05). Similar results were found in study by Celia et al, where T2DM with CAD had hypertension, BMI, elevated LDL and triglyceride level and low HDL compared to non-diabetic group.[25]

Several studies have demonstrated significant reduction in cardiovascular risk in T2DM patients, provided optimal glycemic control, along with adequate management of hypertension, dyslipidemia, and weight reduction. Similarly, reduction in adverse cardiovascular events will be higher if control of classical cardiovascular risk factors begins early in disease course while the same is not true if poor glycemic control is of long duration. This phenomenon is known as metabolic memory, where early glycemic control and its effect, is imprinted in target organs, which is responsible for various long-term protective or deleterious effects. This knowledge should gradually lead to the development of more effective therapeutic strategies to prevent cardiovascular events.[26]

This study has some limitations like-small number of cases and only T2DM with CAD patients are enrolled, so effect of T2DM on classical cardiovascular risk factors without CAD not evaluated.

CONCLUSION

This study demonstrated that patients of CAD with T2DM had higher prevalence of classical risk factors for cardiovascular diseases like hypertension, dyslipidemia and obesity. Good glycemic control with early management of hypertension, dyslipidemia and weight reduction shows reduction in adverse cardiovascular events.

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