Original Article

A Comparative Study of Coronary Angiographic (CAG) Findings Between Diabetic and Nondiabetic Patients

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Abstract

Patients with diabetes mellitus have a higher prevalenceof atherosclerotic heart disease and a higher incidence of myocardialinfarction than the general population. Diabetic patients alsohave several hematologic, metabolic abnormalitiesnot present in their nondiabetic counterparts that may predisposethem to formation of morphologicallycomplex plaques.

Percutaneous coronary angiography (CAG) was performedin 120 consecutive patients with suggestive of ischaemic chest pain. The populationconsisted of 45 (37.50%) diabetic and 75 (62.50%) nondiabetic patients. We observed positive angiographic lesion among both groups comparing site & number of vessel(s) involvement also average percentage of stenosis. The presence of coronary risk factors was not significantlydifferent between the two populations. Total positive angiographic lesion was 79 (65.83%) in both groups. Among the Diabetes mellitus patients positive CAG finding 37 (82.22%).The recognized lesions were single vessel disease (SVD) 10 (27.02),double vessel disease (DVD) 15 (40.54%), triple vessel disease (TVD) 12 (32.43%), diffuse lesions 4 (10.80%) and average vessel stenosis 83.63%.On the other hand, total positive angiographic lesion was 42 (56%) in nondiabetic group; among them single vessel disease (SVD) 14 (33.33%), double vessel disease (DVD) 17(40.47%),triple vessel disease (TVD) 11 (26.19%), no diffuse lesions was found and average vessel stenosis was 78.03%.

The results of the angiographic finding suggest that diabetic patients have a higher incidenceof coronary heart disease (CHD), DVD, TVD, diffuse lesion & marked stenosis of coronary vessel than nondiabetic patient. This increased frequency of complex lesion morphology is more difficult to treat by definitive intervention like percutaneous transluminal coronary angioplasty (PCI) & coronary artery bypass graft (CABG).

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Introduction

Diabetes mellitus (DM) is a well-established risk factor for development of coronary artery disease (CAD).[1,2] Coronary atherosclerosis is not only more prevalent in diabeticpatients but also more severe. The reported prevalence of coronaryartery disease in diabetic patients ranges from 9.5% to 55%.[3,4] Whereas prevalence of 1.6% to 4.1% have been observedin the general population.[5,6]

Incidence of heart diseases & ischaemic heart mortality was shown to be 4 times higher in people with Type-2 DM.[7] Type -1 DM was seen to be associated with at least a 10 fold increase as compared with people without diabetes.[8] In people with DM 40%, 15%, 10% death occur due to ischaemic heart disease (IHD), other heart diseases & cerebrovascular disease (CVD) respectively.[9] Severalin vivo and postmortem studies have shown that diabetic patientshave more diffuse and severe coronary artery disease than thegeneral population.[1,10,11] In addition, the relative risk of myocardialinfarction (MI) is greater in diabetic patients than in the normalpopulation.[12] The cause of this difference in the diabetic population is notwell understood. But it is suggested that diabetic patients have several hematologic, and metabolic abnormalities not present in their nondiabetic counterparts[13,14,15] that may predispose them to formation of more complex plaque.To date, very few studies, have attempted to explain these differences betweendiabetic and nondiabetic patients in our country. Thus this prospective cross sectional study was designed to find out the morphological pattern of coronary lesion in patient with diabetes mellitus and to compare with nondiabetic patients in a peripheral teaching Institute of Bangladesh.

Materials and Methods

120 cases of males and females, who presented in the department of Cardiology, North east Medical college Hospital (NEMCH), Sylhet, from January2013 to June 2013, were included in this study. Involved patients were selected on the basis of inclusion and exclusion criteria as mentioned below. The study was approved by the review committee of the Medical College.

1. Study population

1.a. Inclusion criteria
All patients clinically diagnosed or documented to have CAD, who required coronary angiography (CAG) was taken as study population. Informed consent was taken from all patients.

1. b. The grouping of study population
The study population was divided into two groups as follows

· The study group I
Patients presented with features of ischaemic heart disease (IHD)& having DM (DM group)

• The study group II
Patients presented with features of ischaemic heart disease (IHD) but without DM (non DM group)

1.c. Criteria's for diagnosis of DM
Patient who fulfilled the diagnostic criteria for DM recommended by The World health organization (WHO) in 2000 AD16 as below, with or without other cardiovascular risk factors (e.g. smoking, hyperlipidaemiaetc)

• Patient complaints of symptoms suggestive of DM (polyuria, polydipsia, wt loss) with one of the following.

1. Fasting plasma glucose 7.0 mmol/L (126mg/dl)

2. Random plasma glucose (or 2 hrs after an ideal OGTT) 11.1 mmol/L (200mg/dl)
(In asymptomatic patient two samples are required to confirm the diagnosis)

1.d. Criteria's for diagnosis of non DM cases
Patient do not meet the above WHO criteria's for confirm the diagnosis of DM, with or without othercardiovascular risk factor (e.g. smoking, hyperlipidaemiaetc).

1.e. Criteria's for coronary artery disease (CAD) & Coronary Angiography (CAG)
1. Chronic stable angina pectoris with positive E.T.T (with or without previous MI)
2. Unstable angina pectoris
3. Atypical chest pain with positive E.T.T
4. After acute MI (with or without persistent angina)
5. Asymptomatic patient with noninvasive evidence of myocardial ischaemia (ECG, ECHO)

1.f. Exclusion criteria's
1. Patient with hypertrophic or dilated cardiomyopathy
2. Patient with valvular heart disease
3. Patient with congenital heart disease

2. Coronary Angiographic (CAG) Procedure
CAG & where needed left ventriculography were done in all patients by standard Jud kin's technique through femoral approach by modified Seldinger technique using non ionic dye. Multi angled standard views were recorded for analysis. A comprehensive analysis of Coronary Angiogram (CAG) was done, severity & extent of arterial disease were measured by eye estimation. The pre requisites for CAG were followed according to the hospital protocol, then morphological characteristics of lesion was analyzed
a) Positive CAG -taken when coronary artery stenosis 50%
b) Negative CAG - taken when coronary artery stenosis < 50%
c) According to branches of coronary artery involvement -
1. single vessel disease (SVD) –one coronary artery involve
2. double vessel disease (DVD)- two coronary artery involve
3. triple vessel disease (TVD) -three coronary artery involve
4. Diffuse lesion –diffusely involved one or more coronary artery

3. Statistical analysis
After processing of all available information, statistical analysis of their significance was done. The patients were grouped into those with & without DM having CAG. All parametric values were expressed as mean & nonparametric values were expressed in percentage (%).The significance of difference between two groups were determined by using unpaired student's 't' test, Pearson's chi-square test & 'z' test where applicable. 'P' value of less than 0.05 was considered to be significant.

Results
Total Number of patients studied -120
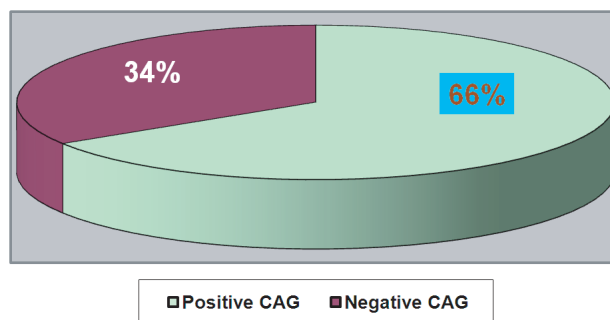
Diagnostic Yield (Sensitivity) of CAG

Fig- 1:Pie chartshowing diagnostic yield of CAG among pts with IHD
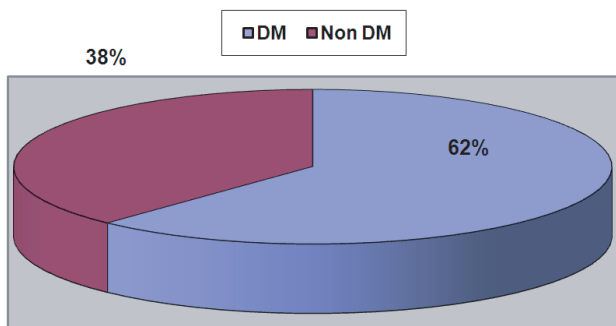
Distribution of patient

Fig-2:Pie chart showing distribution of patient undergone CAG

Positive angiographic lesion among DM & NonDM group
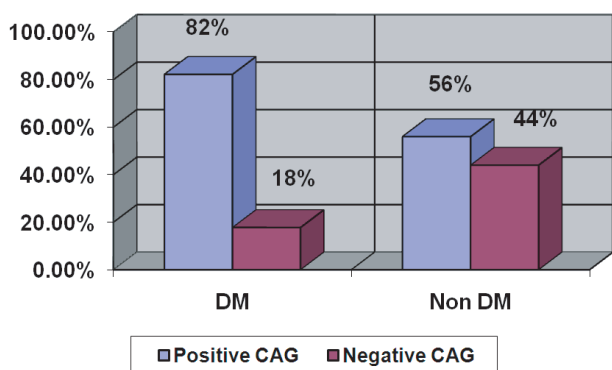

Fig-3: Bar diagram showing positive angiographic lesion

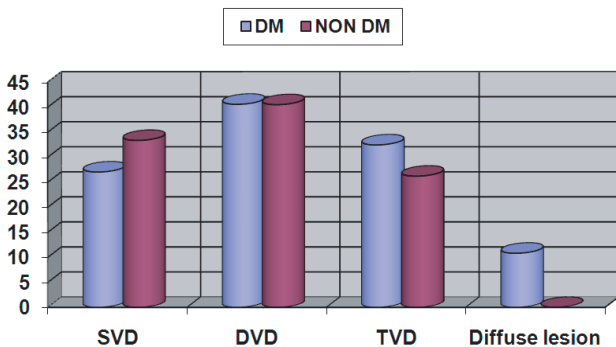Pattern of Vessels involvement in DM and Non DM patients. (N = 120 = 100%)

Fig-4:Bar diagram showingpattern of vessels involvement
Percentage of Vessel stenosis in DM and Non DM group
Table-1: shows percentage of vessel stenosis in DM and Non DM group

	DM	Non DM
LMCA	81%	70%
LAD	81.48%	79.41%
LCX	87.4%	79.55%
RCA	84.65%	83.15%
Average	83.63%	78.03%

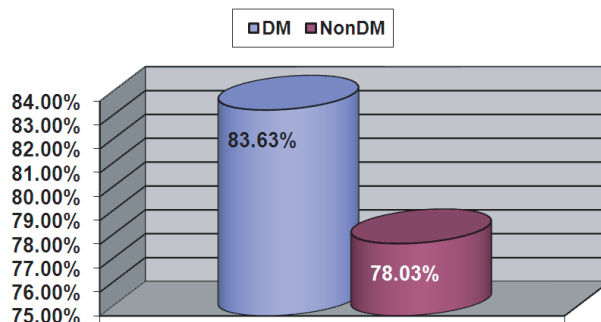
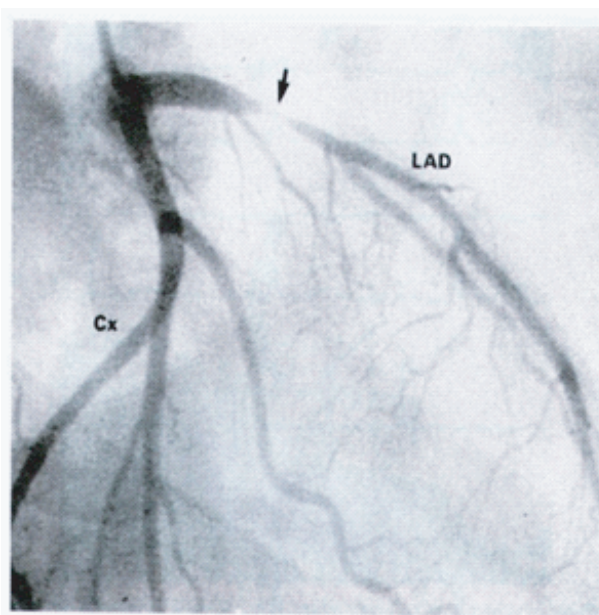Fig-5:Bar diagram shows average vessel stenosis in DM and Non DM group

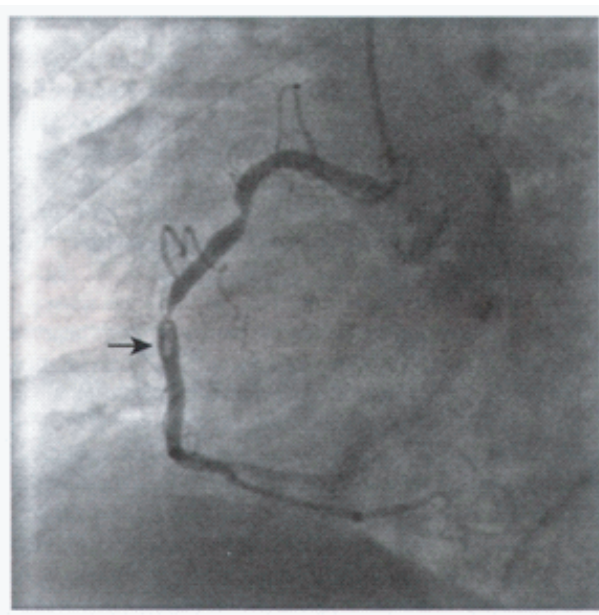Figure - 6: SVD (left anterior descending artery - LAD)
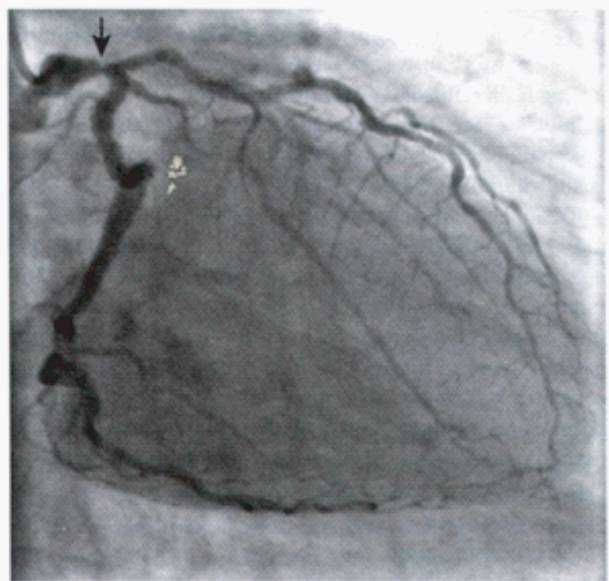

Figure -7: SVD (right coronary artery - RCA)
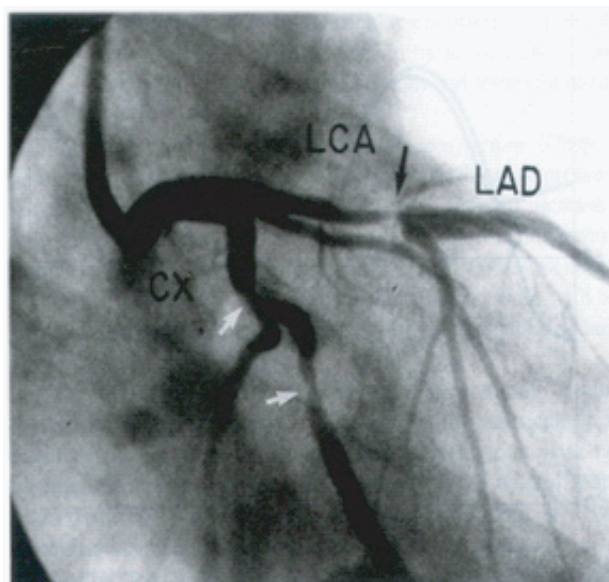
Figure-8: SVD (left main stream - LCA)

Figure - 9:DVD (left anterior descending & circumflex)

Discussion

Although many of the well established risk factors are described for formation of atheoromatous plague, glucose intolerance (DM) accounts for a major part of the high incidence of IHD in certain ethnic groups in South Asia.[16] This study demonstratesincidence & difference of coronary heart disease (CHD), DVD,TVD, diffuse lesion among symptomatic diabetic and nondiabetic patient. The prevalence of coronary artery disease (more than 50% diameterstenosis) is more in DM patients (82.22%) compared to their non DM counterparts (56%).Moreno et al[17] found the incidence of thrombus was higher in patients with diabetes than in patients without diabetes (62% versus 40%).

Our study also demonstrates that diabetic patients had a higher prevalence of three-vesseldisease (TVD) (32.43%versus 26.19%) and lower prevalence of single-vesseldisease (SVD) (27.02% versus 33.33%). Jose A, Silva et al[18] found diabetic patients had a higher prevalence of three-vesseldisease (47% versus 31%) and lower prevalence of single-vesseldisease (18% versus 32%) than nondiabetic patients, althoughthese differences were not statistically significant. In one large autopsy study, Waller et al[11] reported that 91%of patients with adult-onset diabetes (type II) had severe (>75%)narrowing of at least one major coronary artery and 81% hadsevere two- or three-vessel involvement .Our study demonstrates average vessel stenosis 83.63% in DM group as against 78.03% in the non diabetic individuals. Whether or not coronary atherosclerosis is more diffuse in diabeticpatients is controversial.[11,19] In the autopsy study of Wallerand coworkers[11] the diabetic patients had more severe stenosis. However, in another autopsystudy by Crall and Roberts,[20] more extensive and diffuse coronary arterydisease was found in diabetic patients. In our study 10.80% DM patients showed diffuse stenosis which was absent in the non DM group.

This was a small scale study & does not represent the whole CAD population of the region. So, a large scale study is warranted.

References

1. Fein F, Scheuer J. Heart disease in diabetes. In: Rifkin H Jr, ed. Diabetes Mellitus: Theory and Practice. New York, NY: Elsevier Science Publishing Co Inc; 1990:812-823

2. Usitupa M, Siitonen O, Aro A. Prevalence of coronary heart disease, left ventricular failure and hypertension in middle-aged, newly diagnosed type 2 (non-insulin-dependent) diabetic subjects. Diabetologia. 1985;28:22-27

3. Bryfogle JW, Bradley RF. The vascular complications of diabetes mellitus. Diabetes. 1957;6:159-167

4. Anderson RS, Ellington A, Gunter LM. The incidence of arteriosclerotic heart disease in negro diabetic patients. Diabetes. 1961;10:114-118

5. Epstein FH, Ostrander LD Jr, Johnson BC, Payne MW, Hayner NS, Keller JB, Francis T. Epidemiological studies of cardiovascular disease in a total community: Tecumseh, Michigan. Ann Intern Med. 1965;62:1170-1187

6. Kannel WB, Dawber TR, Kagan A, Revotskie N, Stokes J. Factors of risk in the development of coronary heart disease: six-year follow-up experience: the

7. Haffner SM, LehtoS,RonnemaaT,et al. Mortality from coronary heart disease in subject with type 2 diabetes and in nondiabetic subjects with and without prior myocardial infarction.NEng J of med.1998;339:229-234

8. Laing SP, Swerdlow AJ, Slater SD,etal.Mortality from heart disease in a cohort of 23000 patients with insulin treated diabetes.Diabetologia.2003;46:760-765

9. Geiss LS, Herman WH, Smith PJ. Mortality in noninsulin dependent diabetes.In:Diabetes in America.2nd ed. National Diabetes Data Group, National institutes of Health, National Institute of Diabetes and Digestive and Kidney Disease, NIH publication No.95-1468,1995;233-257

10. Hamby R, Sherman L, Mehta J, Aintablian A. Reappraisal of the role of the diabetic state in coronary artery disease. Chest. 1976;70:251-257

11. Waller B, Palumbo P, Roberts W. Status of the coronary arteries at necropsy in diabetes mellitus with onset after age 30 years. Am J Med. 1980;69:498-506

12. Fein F. Heart disease in diabetes. Cardiovasc Rev Rep. 1982;3:877-893

13. Rosove M, Harrison F, Harwig M. Plasma B-thromboglobulin, platelet factor 4, fibrinopeptide A, and other hemostatic functions during improved short-term glycemic control in diabetes mellitus. Diabetes Care. 1984;7:174-179

14. MacRury S, Lowe G. Blood rheology in diabetes mellitus. Diabet Med. 1990;7:285-291

15. Breddin H, Krzywanek H, Althoff P, Schoffling K, Ubeila K. PARD: Platelet aggregation as a risk factor in diabetes: Results of a prospective study.HormMetab Res. 1985;15:63-68

16. FrierB.M, Fisher M.. Diabetes mellitus. In: Boon NA, Colledge NR, Walker BR, editors. Davidson's principles and practice of medicine. 20th ed. Edinburgh: Churchill livingstone; 2006:580-816

17. Moreno Pedro R, Murcia Alvaro M, Palacios Igor F, Leon Miltiadis N, Bernardi Victor H, FusterValentín, Fallon John T. Coronary Composition and Macrophage Infiltration in Atherectomy Specimens From Patients With Diabetes Mellitus. J of the American Heart Association October 2000; 102 (18): 2180-2184

18. Jose A. Silva, Alvaro Escobar,Tyrone J. Collins, Stephen R. Ramee, Christopher J. White. Unstable Angina, A Comparison of Angioscopic Findings Between diabetic and nondiabetic Patients. j of American Heart Association. 1995;92:1731-1736

19. Dortimer AC, Shenoy PN, Shiroff RA, Leaman DM, Babb JD, Liedtke AJ, Zelis R. Diffuse coronary artery disease in diabetic patients: fact or fiction? Circulation. 1978;57:133-136

20. Crall F, Roberts W. The extramural and intramural coronary arteries in juvenile diabetes mellitus. Am J Med. 1978;64:221-230