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ORIGINAL ARTICLE

Comparison of Angiographic Pattern & Complexity of Coronary Artery Disease between Diabetic and Non-diabetic Women with Acute Coronary Syndrome

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Abstract

Background: *Coronary artery disease is responsible for more deaths in women each year than combined all other causes. Diabetes mellitus is a common metabolic disorder, that is a strong risk factor for the development of coronary artery disease in women regardless of age or menopausal status. But there are fewer studies describing the angiographic pattern and complexity of coronary artery disease in this group and whether diabetes mellitus is a key factor for this.*

Objective: *The objective of this study is to find out the differences of angiographic patterns and complexity of coronary artery disease between diabetic and non-diabetic women presenting with acute coronary syndrome.*

Material and methods:. *A total of 100 women (50 Diabetic and 50 non-Diabetic) who were diagnosed as a case of acute coronary syndrome and underwent coronary angiography were included in this study, following inclusion and exclusion criteria. Angiographic pattern was assessed by number of vessel involvement and complexity was determined by calculating the SYNTAX score. The pattern and complexity of coronary artery disease were compared between diabetic and non-diabetic women.*

Results: *In this study, diabetic women had more triple vessel disease (42%), whereas Non-Diabetic women had more single vessel disease (50%). Left anterior decending artery (LAD) was the common artery involvement in both groups and involvement of individual coronary artery LCX, RCA was statistically significant (P values were 0.045 and 0.001 respectively). Complexity assessed by SYNTAX score showed Low SYNTAX score (≤22) was more in Non Diabetic women, High SYNTAX(>32) was more in Diabetic women and were statistically significant (p<.05). Complex lesions such as Aorto-ostial lesion (22%vs 6%), Bifurcation (32%vs 16%), Diffusely diseased vessel (38%vs20%), severe tortuous vessel (36%vs 14%), long lesion (32% vs. 8%) were statistically significant between two groups (P value <.05).*

Conclusions: *Diabetic women with acute coronary syndrome had higher SYNTAX score which reflects more complexity of coronary artery disease compared to Non-Diabetic women as well as higher incidence of triple vessel disease and complex lesions were more in diabetic women.*

Keywords: *coronary angiography, coronary artery disease, Diabetes mellitus, Acute coronary syndrome, women.*

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Introduction

Cardiovascular diseases are one of the most common cause of premature death worldwide, with nearly about 17.7 million death per year.[1] Each year approximately 3.8 million men and 3.4 million women die from CAD. It is becoming a more significant and growing problem day by day in developed countries as well as in developing countries.[2] The annual mortality rate from CAD is greater than that of breast cancer in women, even among the younger groups. Despite the importance of CAD for women, still there is a persistent perception that CAD is a "man's disease". Several studies showed the incidence rate of CAD differs according to age and the incidence of CAD lower in women than men, but rises steadily after

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the fifth decade and nearly equalizes between the sexes by the seventh decade of life.[3] The prevalence of CAD as well as AMI in women progressively increased in Bangladesh from the beginning of this century, particularly among the very young urban population.[4] However there are not many studies describing the presence of CAD in women undergoing coronary angiography and its pattern and distribution.[5] Diabetes mellitus is one of the commonest non-communicable diseases worldwide ranking next to the cardiovascular disorder. It is estimated that around 100 million population is affected with diabetes worldwide.[6] Cardiac involvement in diabetes manifest as coronary artery disease more than as diabetic cardiomyopathy and cardiac autonomic neuropathy.[7] Compared with non-diabetic individuals, diabetic patient have two fold to four fold increased risk of developing CAD. Diabetes is associated with an increased risk for MI and has worse cerebrovascular outcomes after ACS events.[8] In women, diabetes appear as a stronger risk factor for the development of coronary artery disease than in men regardless of age, menopausal status & whether the patient is on oral hypoglycemic agent or insulin depended.[9] Regarding the extent of this increased risk, some studies stated that diabetes effectively eliminates "the female advantage" over men due to hormonal protection, whereas other studies have shown no difference or only a minor difference in the risk conferred by diabetes on women as compared with men.[10] Coronary angiography is the gold standard for detecting coronary artery disease. Some studies clarified among patients who were referred for chest pain and subsequently underwent angiography, a diagnosis of normal coronary arteries was more common in women than men.[11] Procedural outcome and complications after revascularization depend on heterogeneity of the composition, distribution, and location of atherosclerotic plaque within the coronary arteries. According to Criteria established by a joint American College of Cardiology /American Heart Association task force, suggested that procedure success and complication rates are related to a number of different lesion characteristics and pattern and complexity of lesion.[12]

Materials and Methods:

This cross-sectional type of observational study was conducted in the Department of Cardiology, BSMMU, from June 2021 to May 2023, after approval of the protocol by the Institutional Review Board (IRB). A total 100 women admitted with acute coronary syndrome undergoing coronary angiogram were enrolled in the study. Sample size was calculated to find differences between two proportion.[13] Acute coronary syndrome was diagnosed according to fourth universal definition of myocardial infarction.[14] After enrollment, a meticulous history was taken, and relevant clinical examinations and investigation finding were recorded. On the basis of Diabetes, they were divided into Diabetic and non-diabetic group. Coronary angiography was performed by expert interventional cardiologist according to current practice guidelines. Angiographic findings including numbers and types of coronary vessels involved, including left main (LM), left anterior descending (LAD) artery, left circumflex (LCX), and right coronary artery (RCA) were retrieved. The pattern of coronary artery disease (CAD) was assessed with respect to the number of diseased vessels i.e. single, double, or triple vessel disease and noncritical. The complexity of coronary artery disease was assessed by SYNTAX score by online SYNTAX score calculator. Each group patient was divided into three tertiles according to SYNTAX score Low (0-22), intermediate (23-32), and High (>32).

All data were registered, documented, and analyzed in the statistical software, IBM Statistical Package for Social Science (SPSS) version 29.0.1.0 for Windows. Continuous variables were expressed as mean ± SD and categorical variables as frequency and percentage.. Categorical variables were analyzed by the chi-square test. Quantitative variables were analyzed by independent t-test. P value <0.05 was considered statistically significant in this study

Result

A total of 100 patients admitted with acute coronary syndrome undergoing coronary angiogram were enrolled in the study.

\Table I shows Mean age of diabetic women was 50.7 ±8 years and that of non-diabetic women was 53.1± 8.6 years. Analysis revealed no statistically significant of mean age difference between two groups (p>0.05).Regarding menopause status post menopause women were more in number in non-diabetic 80% vs 68% , statistically not significant (p >.05).

Table II shows baseline characteristics of population Hypertension (70%) was highest followed by H/O OCP use (52%), obesity (40%), Dyslipidemia (38%), family history (20%) in Diabetic patient. Among non-diabetic patient H/O OCP use was highest (62%) followed by hypertension (48%), dyslipidemia (32%), family history (14%) No statistically significant difference of risk factors for CAD was found between two groups of patients (p>0.05) except Hypertension (p=0.024).

Table-I

Distribution of study population by demographic characteristics (N=100)

variables		Diabetic (n=50)		Non-Diabetic (n=50)		Total		P Value
		Number	%	Number	%	Number	%	
Age	<40	6	12	5	10	11	11	0.749§
	≥40	44	88	45	90	89	89	
Menopause		34	68	40	80	74	74	0.171§
Mean age± SD		50.7±8		53.1±8.6		51.9±8.4		0.162¥

N=Total number of patients, n=number of patients in each group, SD=Standard deviation
§P value reached from Chi square test.
¥ P value calculated from independent t test

Table-II

Distribution of study population according to baseline characteristics (N=100)

Variables	Diabetic(n=50)		Non-Diabetic(n=50)		Total		P Value
	Number	%	Number	%	Number	%	
HTN	35	70.0	24	48	59	59.0	0.024
Dyslipidemia	19	38.0	16	32	35	35.0	0.529
F/H Of CAD	10	20.0	7	14	17	17.0	0.424
H/O OCP Use	26	52.0	31	62	57	57.0	0.313
Obesity	20	40.0	14	28	34	34.0	0.205
H/O Smoking	0	0	0	0	0	0	-

N=Total number of patients, n=number of patients in each group
P value reached from Chi square test.

Table III shows both STEMI and NSTEMI presentation were in Diabetic group than unstable angina (20.0%). But in non-diabetic group highest percentage of clinical presentation wasNSTEMI (50.0%), followed by STEMI (36%) and unstable angina (14.0%).Analysisrevealed no statistically significant difference in presentation between two groups of patients (p>0.05).

Table-III

Distribution of study population according to their presentation (N=100)

Variables	Diabetic(n=50)		Non-Diabetic(n=50)		Total		P Value
	Number	%	Number	%	Number	%	
STEMI	20	40.0	18	36.0	38	38.0	0.680
NSTEMI	20	40.0	25	50.0	45	45.0	0.314
UA	10	20.0	7	14.0	17	17.0	0.424

STEMI= ST elevated myocardial infarction, NSTEMI=Non ST elevated myocardial infarction
UA=Unstable Angina, N=Total number of patients, n=number of patients in each group
P value reached from Chi square test.

Figure 1 shows number of triple vessel disease (TVD) was more in diabetic group than non- diabetic group [21(42.0%) vs. 8(16.0%)] statistically significant (p<0.05).Non-diabetic group had increased number of single vessel disease than diabetic group and was statistically significant (p<0.05).Non critical disease and Double vessel disease(DVD) were not statistically significant (>.05)

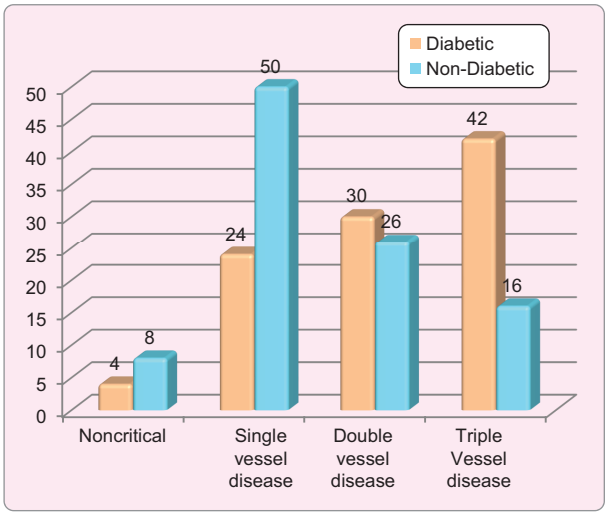

Figure 1: *Comparative Bar Diagram of study population according to number of vessel involvement*

Table IV shows Diabetic patient had more involvement of LAD (35.7% vs. 43.2%), differences was not statistically significant (p>.05), followed by RCA (32.1% vs. 24.7%) and LCX (25.9% vs. 23.5%) the difference were statistically significant (p<0.05).Left main involvement was not statistically significant(p>0.05).

Table V shows as aorto-ostial lesion, Bifurcation, severe tortuosity, diffuse disease, long lesion were statistically significant (p<0.05) between Diabetic and non-diabetic women.

SYNTAX score of the study population shows Low SYNTAX score (0-22) was 40% of Diabetic group and 68% of non-diabetic group and High SYNTAX score (>32) was found 20% patients of diabetic group and 4% of non-diabetic group which were statistically significant (p<0.05). This results indicate that Diabetic women had more angiographic complexity.

Table-IV

Distribution of study population by involvement of individual vessel (N=100)

Variables	Diabetic(n=50)		Non-Diabetic(n=50)		Total		P Value
	Number	%	Number	%	Number	%	
LAD	40	35.7	35	43.2	75	38.9	0.248
LCX	29	25.9	19	23.5	48	24.9	0.045
RCA	36	32.1	20	24.7	56	29.0.	0.001
LM	7	6.1	3	3.7	10	5.3	0.461

LAD= Left Anterior descending, LCX=Left Circumflex, RCA=Right coronary artery
LM=Left main, N=Total number of patients, n=number of patients in each group
P value calculated from Chi Square

Table-V

Distribution of study population on the basis of SYNTAX score parameters (N=100)

Variables	Diabetic (n=50)		Non-Diabetic (n=50)		Total		P Value
	Number	%	Number	%	Number	%	
Aorto-ostial lesion	11	22	2	4	13	13	0.007
Total occlusion	21	42	15	30	46	46	0.149
Bifurcation	16	32	8	16	24	24	0.04
Trifurcation	14	28	9	18	23	23	0.17
Thrombus	7	14	5	10	12	12	0.5
Severe tortuosity	18	36	7	14	25	25	0.01
Diffuse disease	19	38	10	20	29	29	0.03
Long lesion	16	32	4	8	20	20	0.03
Calcification	8	16	5	10	13	13	0.27

N=Total number of patients, n=number of patients in each group
P value reached from Chi square test.

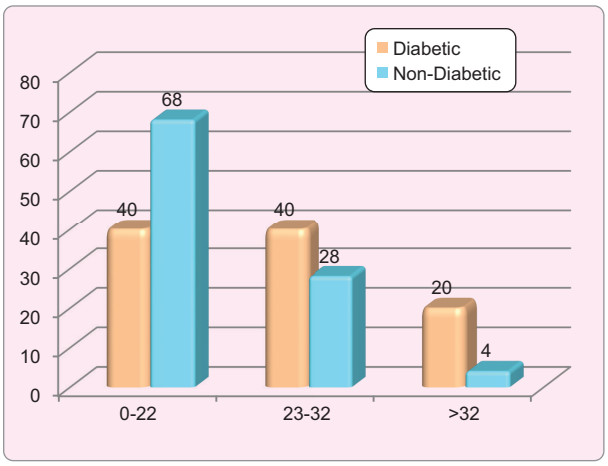

Figure 2: *Comparative Bar diagram of study population according to total SYNTAX score*

Discussion:

The main objective of this study was to compare the pattern and complexity of coronary artery disease between Diabetic and non-diabetic women presented with acute coronary syndromes. A total of 100 women with acute coronary syndromes were enrolled based of predefined inclusion and exclusion criteria who underwent coronary angiography among them 50 women were diabetic and 50 women were non-diabetic. The mean age at presentation was 50.7 ± 8 years in diabetic patients as compared to 53.1± 8.6 years among non-diabetic (p value > 0.05, NS). In (Sousa et al et al. 2006) showed a significant difference in mean age between diabetic and non-diabetic patients [15]. Age of presentation reflects that coronary artery disease in women is elderly presentation and there may be hormonal protection against coronary artery disease. In this study Diabetic patients had significant number of triple vessel disease than non-diabetic patients [21(42.0%) vs. 8(16.0%)] and statistically significant (P <0.05). Double vessel disease was more common in diabetic patients [15(30.0%) vs. 13(26.0%)], but statistically no significant. Non -diabetic patients had increased number of single vessel disease than diabetic patients and was statistically significant (p<0.05).Noncritical disease was not statistically significant (>.05) between the two groups. In (Sousa et al. 2006) TVD and noncritical was significant between the two groups (p <.001).But no significant difference was found in SVD and DVD. The pattern of coronary artery differs in different studies maybe due to duration and control of diabetes mellitus. But one thing is common almost all studies that Diabetic patient had more triple vessel disease compared to non-diabetic patients. This indicates the adverse effect of diabetes in coronary artery disease.The commonest vessel involved in both groups was LAD, 35.7% in the diabetic group and 43.2% in the non-diabetic group, followed by RCA and LCX. Similar vessel involvement with varying percentages was also reported in the study by Siddiqui et al. (2023).[16] Aorto-ostial lesion, Bifurcation, severe tortuosity, diffuse disease, long lesion were statistically significant (p<0.05) between Diabetic and non-diabetic women. These findings are consistent with Mukhopadhyay et al., (2022) study.[19] The complexity assessment by SYNTAX score of this study revealed low SYNTAX score (0-22) in non-Diabetic patients significantly higher compared to diabetic patient (68% vs. 40%), (p 0.005). On the other hand, High SYNTAX (>32) score was found more in Diabetic patients (20% vs. 4%) and this high SYNTAX score was significantly higher in this group (p 0.01). These results consistent with (Mukhopadhyay et al. 2022) study.[17] This study's findings hypothesized that diabetic women had more complex coronary artery disease compared with non-diabetic women. However this study was done in a single hospital, no correlation between duration of DM and pattern of vessel involvement were studied. Angiographic pattern and complexity of coronary artery disease were evaluated by visual estimation, so the chance of interobserver and intraobserver variation is likely to be present. Intravascular ultrasound (IVUS), Optical coherence tomography (OCT), or Fractional flow reserve (FFR) was not used in this study.

Conclusion:

The complexity of coronary artery disease in diabetic women was more compared to non-diabetic women. Involvement of Aorto-ostial lesions, Bifurcation, Diffusely diseased vessels, severe tortuosity and long lesion were more commonly seen in diabetic patients presenting with acute coronary syndrome. The incidence of triple vessel or multivessel disease as well as SYNTAX score was significantly higher with Diabetic women. These high-risk findings in diabetic women make them prone to suboptimal results after percutaneous transluminal coronary angioplasty (PTCA).

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Conflict of Interest:

The authors declare no conflicts of interest.

Ethical approval:

Ethical approval for this study was granted by the Institutional Review Board of BSMMU (memo number: BSMMU/2022/6739)

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