Comparison of coronary angiographic findings in diabetic and non diabetic women in Upper Egypt with non ST segment elevation myocardial infarction

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Abstract: Worldwide more than 140 million people suffer from diabetes mellitus, which is one of the most common non communicable diseases. Diabetes mellitus magnifies the risk of cardiovascular morbidity and mortality and is known to be the major risk factor for development of coronary artery disease. The purpose of this study was to compare the coronary angiographic findings in diabetic and non-diabetic women in upper Egypt with non ST segment elevation myocardial infarction. The present study was conducted in a co-operation between Cardiology Department Faculty of Medicine, Al-Azhar University and Cardiology Department, Luxor international hospital over a period from December 2009 to December 2010. The present study included 30 female patients presented with Non ST segment elevation myocardial infarction, patients were divided into 2 groups: Group (I) Fifteen diabetic patients (56.133± 7.049 years old), group (II) Fifteen Non diabetic patients (56.267 ± 8.189 years old).Transthoracic echocardiography (including M-mode, 2D and Doppler imaging) with standard views have been taken. Coronary angiography was done for all patients. Regarding age and other risk factors, there was no statistically significant difference between the two groups (P 0.0962). The number of diabetic patients with single vessel disease was 5, with two vessels disease were 3, and with three vessels were 6, while the number of non diabetic with single vessel disease was 12, with two vessels disease was 1, with three vessel disease was zero and the difference between the two groups was statistically significant (P 0.01). The affection of RCA was more common in group I than group II. Presence of collateral circulation was more in group I than that of group II. Type A lesion was more prevalent in group II compared with group I while type B and C lesion was more in diabetics and the difference between the two groups was statistically significant (P 0.01). Seven diabetic patients had undergone PCI, 7 had CABG decision, and 1 received medical treatment while in the non diabetic patients, the PCI was done for 13, no CABG, and medical treatment for 2 of them and the difference between the two groups was statistically significant, there was a statistically significant difference between the two groups as regard to echocardiographic findings (P 0.001). Diabetic patients had more multiplicity of coronary artery affection, more diffuse disease and more severe stenosis, the affection of the right coronary artery was more common in diabetic patients, morphology of coronary lesions was more complex in diabetic patients than the non diabetics, diabetic patients had developed collateral circulation and left ventricular systolic dysfunction more than non diabetics.

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1. Introduction

Cardiovascular diseases (CVDs) are the leading cause of death and morbidity in diabetic patients. This group is two to four folds more likely to develop cardiovascular disease than the non diabetic group **(Brochier and Arwidson, 1998).** Diabetes mellitus (DM) is known to be a major risk factor for the development of coronary artery disease (CAD) **(Mueller et al., 2002).** The number of adults with DM worldwide is likely to grow from 135 million in 1995 to approximately 300 million in 2025 **(Gowda, 1998).** CVDs are the main cause of death in industrialized countries, in women as well as in men. CAD represents 23% of all deaths in women **(Stramba-Badiale et al., 2006).** Current AHA/ACC guidelines for the management of patients with unstable angina and non ST segment elevation myocardial infarction (UA/NSTEMI) recommend an early invasive strategy for most patients **(The task force of the European society of cardiology 2002**). Albeit glycemic control in diabetics is clearly related to micro vascular complications, its contribution to macro vascular atherosclerosis is still controversial **(Grimaldi and Heurtier, 1999).** Most studies performed in patients with chronic angina showed that the atherosclerotic plaques are not similar in both groups and the disease is more diffuse and severe in diabetic patients (**Meigs et al., 1997)**. The aim of this study was to compare the coronary angiographic findings in diabetic and non-diabetic women in upper Egypt with non ST segment elevation myocardial infarction

2. Patients and Methods

The present study included 30 consecutive females presented with non ST segment elevation myocardial infarction admitted to the cardiology department at Luxor international hospital over a period from December 2009 to December 2010. The patients were divided into 2 groups: Group I included 15 diabetic patients, and group II included 15 non diabetic patients. Inclusion criteria were non ST-segment elevation myocardial infarction, defined by electrocardiographic (ECG) ST-segment depression or prominent T-wave inversion and positive cardiac biomarkers of necrosis (e.g. Cardiac Troponin) in the absence of ST-segment elevation and an appropriate clinical setting (chest discomfort or angina equivalent) **(Anderson et al., 2007)**. Exclusion criteria were hypertension, valvular heart diseases and cardiomyopathy. All patients included in this study were subjected to the following: Informed consent, full medical history with special interest in (a) Symptoms (chest pain, dyspnea and sweating) and (b) Risk factors: Dyslipidemia: known by either the patient was taking lipid lowering drugs or by elevated serum levels of LDL-cholesterol, smoking, diabetes mellitus diagnosed according to the criteria set by American Diabetes Association (Beckman et al., 2002)) including symptoms of diabetes and casual plasma glucose level of ≥200 mg/dl (11.1 m mol/l), and fasting plasma glucose level of ≥126 mg/dl (7.0 m mol/l)**.** Past history of ischemic heart disease (IHD) and family history of IHD and obesity were also taken. Clinical examination included (general and local). 12 lead surface resting electrocardiograms were obtained from all patients on admission and discharge showing ST depression and/or T wave inversion. Medical treatment included: (a) Aspirin initial loading dose of 162 to 325mg followed by a maintenance dose of 75 to 81mg/d, (b) Low molecular weight heparin according to bodyweight, (c) Clopidogrel**:** The patients who were not receiving regular clopidogrel (75mg daily) before the procedure were given 300 – 600 mg clopidogrel 4 to 8 hours before PCI., (d) Beta-blocker if not contraindicated, (e) Nitrates and (f) Statins. Lab investigations: (a) Cardiac enzymes (Troponin, CK-MB) at 0,6,12 hours of admission, (b) Blood glucose (fasting and casual) (on admission and two occasions in different days) and (c) Lipid profile. Echocardiography: Fractional shortening% and Ejection fraction were measured by M-Mode method. Coronary angiography was performed from the right femoral artery approach after adequate local anesthesia, using lidocaine 2%, using a modified Seldinger's technique (Prati et al., 2010). Multiple views were taken using appropriate sized catheters. Angiographic films were reviewed by two interventional cardiologists to determine the severity of atherosclerotic lesion. The study included comment on the following; (1) Number of affected vessels, (2) Severity of lesion: Severe lesion was determined according to the description provided by AHA/ACC (Ambrose et al ., 1988) as occlusion > 50% for the left main coronary artery and >70% or equal for all vessels, (3) Distribution of coronary affection and (4) Type of lesions: lesions were analyzed and divided into: Type A lesion: <10 mm in length, concentric, smooth contour, little or no calcification, and no thrombus. Type B lesion: 10 to 20 mm in length, eccentric, moderate to heavy calcification and some thrombi present. Type C: >20 mm in length, total occlusion >3 months, inability to protect major side branches, degenerated vein graft with friable lesions **(Ryan et al., 1993).** (5) Types of revascularization procedure (medical treatment, PCI and CABG). (6) Collateral circulation was classified according to **Cohen and Rentrop (1986)** grading system from 0 to III grades and (7) Presence of visible thrombus was defined as a subtraction image of the interluminal contrast.

Statistical analysis:

Data were analyzed by Microsoft Office 2003 (excel) and Statistical Package for Social Science (SPSS) version 10. Parametric data were expressed as mean ± SD to measure the central tendency of data and the distribution of data around their mean, and non parametric data was expressed as number and percentage of the total. The mean and standard deviation (SD) were calculated and compared using the student's t-test. P value $\leq$ 0.05 was considered significant and P value $\leq$ 0.01 was considered highly significant.

3. Results

The demographic, clinical, electrocardiographic, echocardiographic and angiographic data of both groups were in tables 1-10.

As regard to age, there was no significant difference between the two groups (P > 0.05) (Table 1).

Table (1): Comparison between the two groups regarding age.

Groups	Age						T-test	
	Range			Mean	±	SD	T	P-value
Group I	45.000	-	65.000	56.133	±	7.049	-0.048	0.962
Group II	40.000	-	75.000	56.267	±	8.189		

As regard to the risk factors there were no significant differences between the two groups (P>0.05) (Table 2).

Table (2): Comparison between the two groups regarding risk factors.

Groups / Parameters	Group I		Group II		Total		Chi-square	
	N	%	N	%	N	%	X^2	P-value
Dyslipidemia	14	93.330	14	93.330	28	93.330	0.000	1.000
Family history	10	66.670	6	40.000	16	53.330	2.143	0.143
Previous IHD	12	80.000	10	66.670	22	73.330	0.682	0.409
Smoking	4	26.670	7	46.670	11	36.670	1.292	0.256
Obesity	10	66.67	12	80.00	22	73.33	0.170	0.679

As regard to chest pain, there was no significant difference between the two groups (p> 0.05) (Table 3).

Table (3): Comparison between the two groups regarding Chest pain.

Chest pain		Groups					
		Group I		Group II		Total	
		N	%	N	%	N	%
Atypical		6	40.00	3	20.00	9	30.00
Typical		9	60.00	12	80.00	21	70.00
Total		15	100.00	15	100.00	30	100.00
Chi-square	X^2	1.429					
	P-value	0.232					

There was no significant difference between the two groups regarding ECG changes (p> 0.05) (Table 4).

Table (4): Comparison between the two groups regarding ECG changes.

ECG changes	Groups					
	Group I		Group II		Chi-square	
	N	%	N	%	X^2	P-value
ST depression	7	46.67	3	20.00	2.400	0.121
T wave inversion	13	86.67	13	86.67	0.000	1.000
Both	5	33.33	1	6.66	1.875	0.170

There was a highly significant difference between the two groups regarding ejection fraction which was higher in the non diabetic patients (P-value=0.001) (Table 5).

Table (5): Comparison between the two groups regarding to ejection fraction (EF).

Groups	Ejection fraction						T-test	
	Range			Mean	±	SD	T	P-value
Group I	50.000	-	66.000	55.333	±	5.627	-4.833	=0.001*
Group II	58.000	-	70.000	64.400	±	4.595		

There was a significant difference between the two groups regarding the number of vessels which indicated more multi vessels affection in diabetic patients (P-value=0.016) (Table 6).

Table (6): Comparison between the two groups regarding number of vessels with lesions more than or equal 70 %.

Numbers of arteries with lesion ≥70%		Groups					
		Group I		Group II		Total	
		N	%	N	%	N	%
0		1	6.67	2	13.33	3	10.00
1		5	33.33	12	80.00	17	56.67
2		3	20.00	1	6.67	4	13.33
3		6	40.00	0	0.00	6.00	20.00
Total		15	100.00	15	100.00	30	100.00
Chi-square	X^2	10.216					
	P-value	0.016					

There was a significant difference between the two groups regarding only the RCA affection which was more in the diabetic patients (P-value=0.003) (Table 7).

Table (7): Comparison between the two groups regarding distribution of coronary affection.

Groups / Coronary arteries	Group I		Group II		Total		Chi-square	
	N	%	N	%	N	%	X^2	P-value
LAD	10	66.67	9	60.00	19	63.33	0.144	0.705
D1	3	20.00	3	20.00	6	20.00	0.000	1.000
LCX	7	46.67	5	33.33	12	40.00	0.556	0.456
OM1	5	33.33	1	6.67	6	20.00	3.333	0.068
OM2	1	6.67	0	0.00	1	3.33	1.034	0.309
RCA	10	66.67	2	13.33	12	40.00	8.889	0.003
PDA	2	13.33	0	0.00	2	6.67	2.143	0.143
LMCA	1	6.67	0	0.00	1	3.33	1.034	0.309

LAD (left anterior descending), D 1(diagonal 1), LCX (left circumflex), OM (obtuse marginal), RCA (right coronary artery), PDA (posterior descending artery), LMCA (left main coronary artery)

There was a significant difference between the two groups regarding collateral circulation which was more developed in the diabetic patients (P-value=0.034) (Table 8).

Table (8): Comparison between the two groups regarding collateral circulations.

Collateral circulation		Groups					
		Group I		Group II		Total	
		N	%	N	%	N	%
I		3	20.00	8	53.33	11	36.67
II		2	13.33	4	26.67	6	20.00
III		10	66.67	3	20.00	13	43.33
Total		15	100.00	15	100.00	30	100.00
Chi-square	X^2	6.709					
	P-value	0.034*					

There was a significant difference between the two groups regarding type of lesion which indicated more complex lesion in the diabetic patients (P-value=0.0148) (Table 9).

Table (9): Comparison between the two groups regarding type of lesion

Type of lesion		Groups					
		Group I		Group II		Total	
		N	%	N	%	N	%
A		3	20.00	9	60.00	12	30.00?
B		9	60.00	6	40.00	15	40.00?
C		10	66.67	2	13.33	12	30.00?
Chi-square	X^2	8.431					
	P-value	0.0148*					

A: type A coronary artery lesion B: type B coronary artery lesion C:type C coronary artery lesion

There was a significant difference between the two groups regarding the type of revascularization procedure (P-value=0.0104) (Table 10).

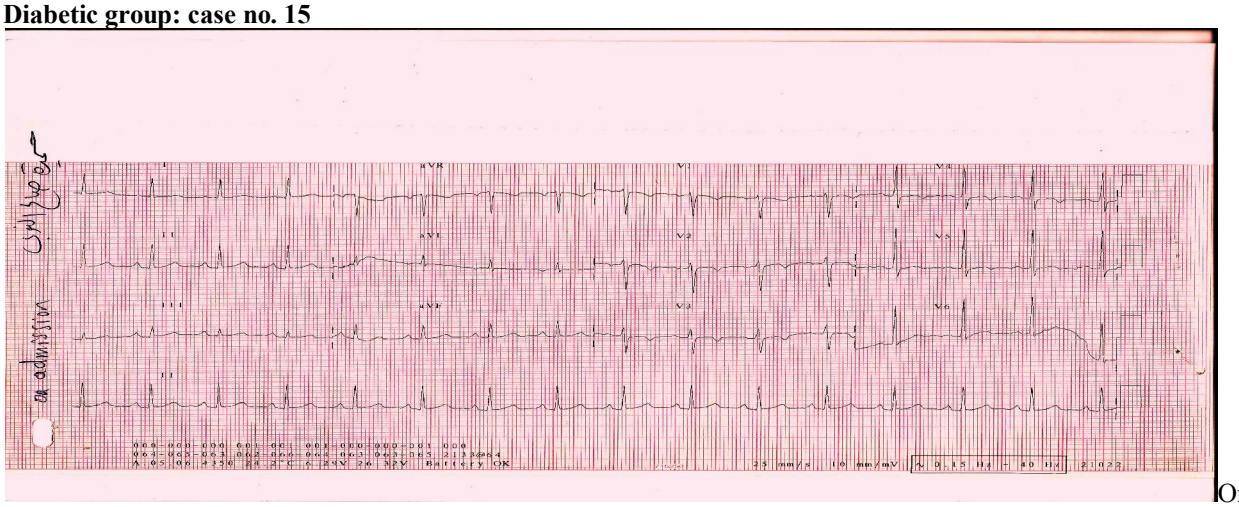
Table (10): Comparison between the two groups regarding type of revascularization procedure.

Type of Revascularization procedure		Groups					
		Group I		Group II		Total	
		N	%	N	%	N	%
CABG		7	46.67	0	0.00	7	23.33
PCI		7	46.67	13	86.67	20	66.67
Medical treatment		1	6.67	2	13.33	3	10.00
Total		15	100.00	15	100.00	30	100.00
Chi-square	X^2	9.133					
	P-value	0.0104*					

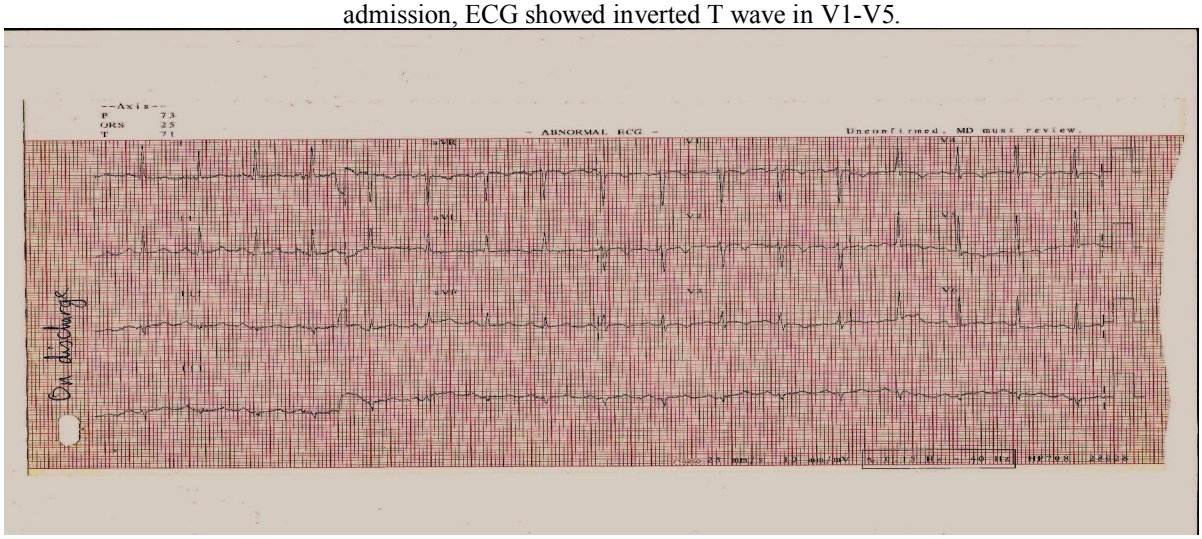
CABG (coronary artery bypass graft), PCI (percutaneous coronary intervention)

Selected Cases

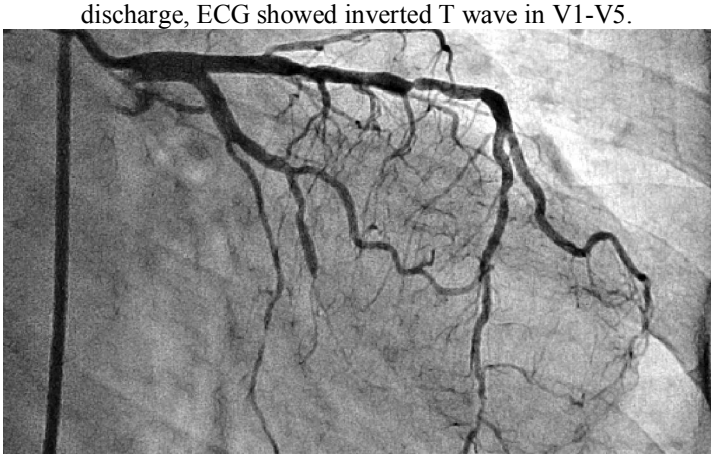
Diabetic group: case no. 15



On admission, ECG showed inverted T wave in V1-V5.

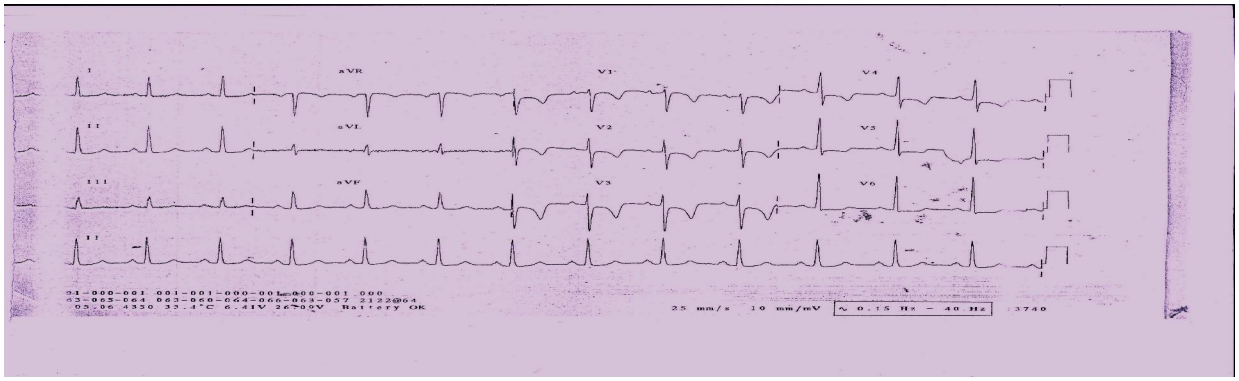


On discharge, ECG showed inverted T wave in V1-V5.

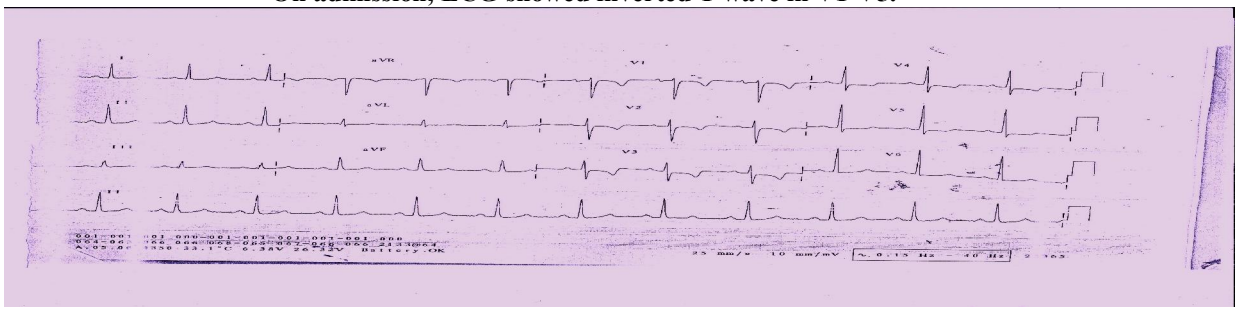


Right anterior oblique (RAO) view with caudal angulations showed 95% mid LAD lesion

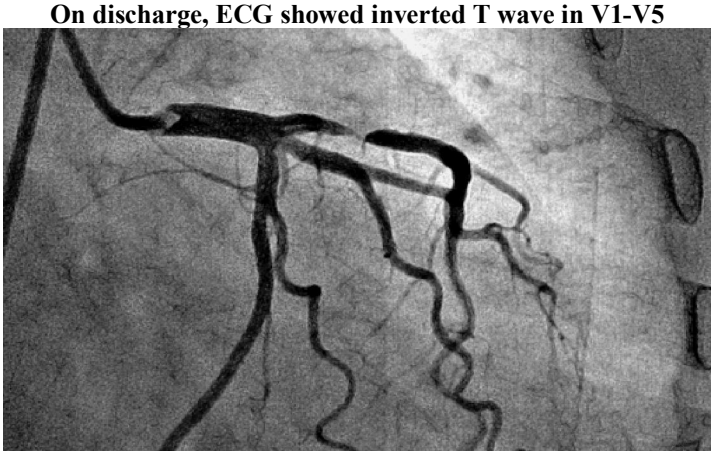
Non diabetic case no.8



On admission, ECG showed inverted T wave in V1-V5.



On discharge, ECG showed inverted T wave in V1-V5



Right anterior oblique (RAO) view with caudal angulations revealed proximal subtotal LAD lesion.

4. Discussion

Cardiovascular diseases are the leading cause of death and mortality in diabetic patients, with two to four folds increase of cardiovascular disease in diabetic than non diabetic patients (***Brochier and Arwidson, 1998***). Diabetes mellitus is worldwide epidemic disease, and its prevalence is rapidly increasing in both developing and developed countries. Changing of the incidence and prevalence of DM is a major public health and economic problem ***(Narayan et al., 2000).*** Diabetes mellitus is known to be a major risk factor for the development of coronary artery disease (***Mueller et al., 2002).***

In the present study, there were no significant correlations of these general characteristics of the studied patients (age, smoking, dyslipidemia, family history of IHD, previous history of IHD and obesity) between the two groups (p> 0.05). This is in agreement with the study provided by ***(Melidones et al., 1999***), and in disagreement with the study provided by ***(Alvaro et al., 2004***), in which dyslipidemia was more common in diabetic patients.

In the current work, there was no significant correlation between the two groups whether the chest pain was typical or atypical (p> 0.05). This is in agreement with the studies provided by ***Sainani (1992***) and ***Peter et al. (1999***).

In the present study, there was a significant correlation as regard to LV systolic function between the two groups, as LV systolic function was better in non diabetic group (p 0.001). This is in agreement

with the studies provided by ***Usitupa et al. (1985***) and ***Lindvall et al. (1999).***

In the present study there was a significant correlation between the two groups as regard to the number of arteries with lesion ≥70% (P 0.016), which was higher in the diabetic group. This is in agreement with the studies provided by ***Calton et al. (1995), Melidones et al. (1999***) and ***Waldbecher et al. (1999***), which showed that multi vessels disease was more common among diabetic patients. ***Cariou et al. (2000), Natali et al. (2000)*** *and* ***Thomas et al. (2002)*** showed higher coronary score in diabetic group. ***(Norhammer et al., 2004***) in the study of the outcome of unstable coronary artery disease revealed that, three vessels disease are more common in diabetic patients than non diabetic patients. ***Kasamy et al. (2005)*** and ***Jose Marconi et al. (2006***) showed that coronary angiographic finding in patients with UA/NSTEMI revealed that the number of severely involved vessel is higher among diabetic patients. This is in agreement with the present study and in disagreement with the studies provided by ***Waller et al. (1980), Abadie et al. (1983), Pajunen et al. (1997)*** and ***Hochmn et al.(1998***) that showed no difference between the two groups.

In the present study there was a significant correlation between the two groups regarding RCA affection where it was more prevalent in the diabetic group (P 0.003). This is in disagreement with the study provided by ***(Ledru et al., 2001)*** which had demonstrated that persons with diabetes more frequently have left main coronary artery lesion.

In the present study there was a significant correlation between the two groups where the collateral circulation was more developed in the diabetics. This is in agreement with the study provided by ***(Meldonis et al., 1999)*** which reported that diabetes was associated with increase of the collateral development. And in disagreement with the studies provided by ***Abaci et al. (1999)*** *and* ***Morgan et al. (2003)*** which showed that coronary collateral vessels (CCV) were poorer in diabetic patients.

In the present study there was a significant correlation between the two groups where type A lesion was more prevalent in non-diabetics while type B and type C lesions were more prevalent in diabetics (P 0.0148). This is in disagreement with the study provided by ***(Jose Marconi et al., 2006)*** where there was no difference in the atherosclerotic plaque morphology.

In the present study there was a significant correlation between the two groups where the incidence of CABG surgery was higher in the diabetic group, while PCI and the medical treatment were more in non diabetics (P 0.0104)). This is in agreement with the study provided by ***Detre et al. (1999***) and ***Braunwald et al. (2002).***

5. Conclusion:

Diabetic patients had more multiplicity of coronary artery affection, more diffuse disease and more severe stenosis, the affection of the right coronary artery is more common in diabetic patients; morphology of coronary lesions is more complex in diabetic patients than the non diabetics, diabetic patients had developed collateral circulation and left ventricular systolic dysfunction more than non diabetics.

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