CODEN [USA]: IAJPBB ISSN: 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

http://doi.org/10.5281/zenodo.3469545

Available online at: http://www.iajps.com Research Article

AN ANALYTICAL STUDY TO ASSESS ASSOCIATION OF SEVERITY OF CORONARY ARTERY DISEASE AND DIABETIC RETINOPATHY

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Article Received: August 2019 **Accepted:** September 2019 **Published:** October 2019

Abstract:
Objectives: *We aimed in this analysis to verify the relationship among severity of Coronary Artery Disease (CAD) and Diabetic Retinopathy (DR) and to assess the association of stage of severity of CAD with DR.*
Study design: *It was a cross-sectional type of analysis.*
Place and Duration: *This study was conducted in Holy Family and Benazir Bhutto Hospital Rawalpindi for the duration of one year from March 2018 to February 2019.*
Methodology: *Diabetic Mellitus cases who were suffering from this disease for more than a duration of 5 years which were tested through coronary angiography (CA) were selected for this analysis. The total patients were examined through fundoscopy and were classified into proliferative-DR, pre-proliferative-DR and N0-DR. Coronary angiography was carried out to evaluate the severity of Coronary Artery Disease (CAD) and patients were classified as severe CAD, moderate, mild and none depending upon the number of veins taking part or left main stem (LMS) ailment. The association among CAD and DR was concluded through chi-square test and prevalence odds ratios (POR) were evaluated through logistic regression model.*
Results: *A number of 166 patients having average age of 55.5 ± 8.8 years were included in this study out of which number of male patients was 79, number of NO DR cases was 35, pre-proliferative DR cases were 110 and number of 21 patients had proliferative-DR whereas number of 63 patients had mild CAD, no of 50 patients were having moderate CAD and 18 patients had severe CAD. The relationship among severity of CAD and diabetic retinopathy (DR) was evaluated as 86.68 where the value of p was 0.000 through chi-square test. PORs for severity of coronary artery disease (CAD) by raising stage of DR were observed as usually raised from 0.27 times for no-DR to 4.27 times for pre-proliferative-DR and for proliferative-DR 6.33 times after managing different consequent influences.*
Conclusion: *It was concluded through our study that Diabetic Retinopathy (DR) is just not highly related to Coronary artery disease but a most severe CAD raising the odds of CAD by 2.27 times detected at higher stage of retinopathy.*
Keywords: *Diabetes Mellitus, Diabetic Retinopathy, Coronary Artery Disease*

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Please cite this article in press Muhammad Daniyal et al., ***An Analytical Study To Assess Association Of Severity Of Coronary Artery Disease And Diabetic Retinopathy.,*** *Indo Am. J. P. Sci, 2019; 06(10).*

INTRODUCTION:

Intemperate diabetes mellitus (DM) by chronic hyperglycemia directs towards micro and macrovascular complexities [1]. Analysis revealed DM to be sovereign consequent influence of coronary artery disease (CAD). Diabetic retinopathy (DR) and diabetic nephropathy are significant indicators of microvascular insult secondary to Diabetic mellitus (DM) direct to usual disease in diabetics. Initial prediction and involvement is necessary to stop vasculopathy [2]. Several analyses observed that occult atherosclerosis, silent peripheral arterial disease (PAD), silent CAD and silent myocardial infarction (MI) in diabetic mellitus (DM) patients [3,4]. Coronary artery disease is main factor of disease and death rate macrovascular symptoms of Diabetic mellitus [5,6]. The interaction among macrovascular and microvascular indicators required to be detected if DR is related to Coronary artery disease and it almost requires our interest. Therefore, just analyses concerning the interaction of diabetic nephropathy along CAD accessible and main observation has been carried out in this concern but no usual perception related to CAD with DR is still accessible [7,8]. A few analyses have given us with inadequate reports regarding interaction of CAD and DR [9,10], possibly due to integration of definite cardiovascular diseases like cardiovascular (CV) mortalities, non-fatal myocardial infarction (MI) or coronary heart failure (CHF) but these analyses have not inter-related the severity of CAD with Stage of DR [11,12]. Through our analysis we intended to predict the interaction of DR with severity of coronary artery disease (CAD) and to conclude the consequences of DR in evaluating the prevalence odds ratio (POR) for CAD.

METHODOLOGY:

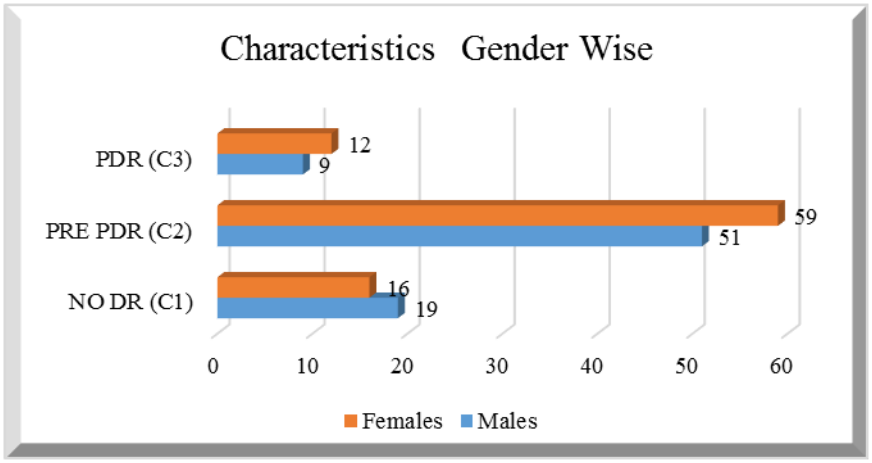
This study was conducted in Holy Family and Benazir Bhutto Hospital Rawalpindi for the duration of one year from March 2018 to February 2019. Diabetic mellitus cases for minimum 5 years represented to cardiology unit with history of angina Canadian Cardiovascular Society Angina Grading Scale III/IV (CCS III/IV), number of 13 patients who were examined through coronary angiography were contained in this analysis. The exclusion criteria were consisting of patients with congenital heart disease, heart failure, cardiomyopathy, anemia, coronary liver disease (CLD), hypertensive retinopathy, retinal pathologies as pan-retinitis, chronic kidney disease (CKD), photocoagulation, malignancies, cataracts or history of cataract surgery, angioplasty or bypass surgery, history of acute coronary syndrome (ACS) to reduce confusing predisposition. A total enumerates sampling method that is non-probability technique was carried out for inclusion of patients. A written agreement proforma was gathered from all enrolled patients. A detailed examination was processed to meet the requirements of sorted in and sorted out patients by getting the relevant blood investigations, echocardiography, electrocardiography (ECG) and physical test. For the evaluation of severity of CAD, coronary angiography was processed by senior interventional cardiologists in the cardiac catheterization laboratory through Axiom Artis Siemens 2005 machine. On the basis of number of veins having size more than 1.5mm caliber that are above than a percentage of 70.0 % stenosed like triple vessel disease (TVD), double vessel disease (DVD), Single vessel disease (SVD), none accordingly, patients were classified as none, mild, moderate and severe coronary artery disease. All information consisting of demographic differences were noted in a predesigned written agreement form or proforma. The information was tested in SPSS 21 Repeated differences like HbA1c intensities and age were noted in mean ± SD. Categorical variables such as diabetic retinopathy, coronary artery disease and gender were noted in percentages and rate of recurrence. Chi-square test was carried out for matching categorical variables. Chi-square test was used to develop association among CAD and DR. Logistic regression model was used to evaluate PORs.

RESULTS:

Number of 166 patients were contained with the average age of 55.5 ± 8.8 years within the analysis out of which percentage of 47.5 % patients were males. Baseline features of cases are given in table no 01.

Table No 01: Base Line Characteristics of Patients

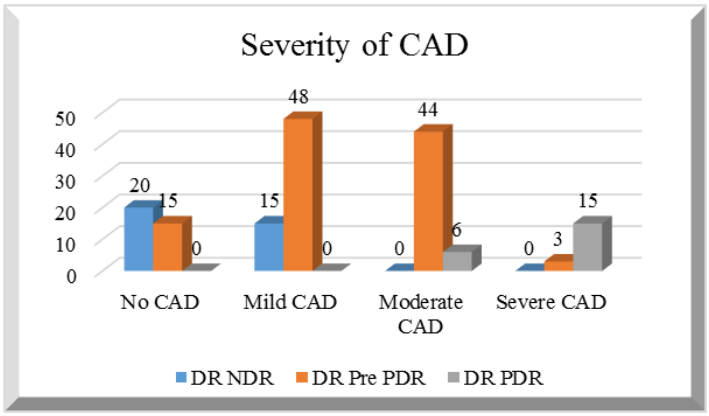
VARIABLES	NO DR (C1)		PRE PDR (C2)		PDR (C3)		X2 Sig: C1-C2	X2 Sig: C2-C3
	Quantity	(%)	Quantity	(%)	Quantity	(%)		
Number of Patients	35	100%	110	100%	21	100%		
Age (years)	54.2±9.2		55.5±8.6		55.5±7.1			
Males	19	54.2%	51	46.3%	9	42.8%		
Females	16	45.7%	59	53.6%	12	57.1%		
Diabetes Mellitus Duration (years)	8.9±1.3		10.1±1.2		11.1±1.1			
Insulin Use	9	25.7%	28	25.4%	8	38.0%	0.71	0.05
Hypertension	18	51.4%	66	60%	12	57.1%	0.8	0.5
Hypertension Duration (years)	5.2±1.6		5.1±1.8		6.2±1.1			
Smoking	16	45.7%	46	41.8%	8	38.0%	0.6	0.2
Family History of CAD	8	22.8%	45	40.9%	7	33.3%	0.05	0.12
Family History of DM/HTN	11	31.4%	83	75.4%	17	80.9%	0.05	0.31
Systolic Blood Pressure (mmHg)	141.1±1.9		142.2±4.5		143.1±4.6			
Diastolic Blood Pressure (mmHg)	91.1±1.1		91.6±2.9		90.8±1.1			
Rest ECG Changes	13	35%	52	47%	13	63%	0.05	0.04
ETT +ve								
Anterior Leads	6	15%	62	57%	19	90%	0.03	**0.04**
Inferior Leads	13	35%	21	19%	1	5%	0.31	**0.06**
Miscellaneous	16	50%	27	24%	1	5%	0.05	**0.05**
Diastolic Dysfunction	10	27%	45	41%	15	70.9%	<0.05	**<0.05**
Triglycerides (mg/dl)	163.0±47.6		196.7±59.1		174.9±46.2			
Low Density Lipoproteins (mg/dl)	116.4±22.9		124.6±30.9		124.9±34.6			
High Density Lipoproteins (mg/dl)	41.7±3.5		39.5±5.0		40.8±3.2			
Cholesterol (mg/dl)	190.9±30.9		200.2±24.5		199.5±22.1			
HbA1c (gm/dl)	6.9±0.7		8.0±1.1		8.8±1.3			
HbA1c Category								
<7 (Good)	27	77%	25	22.7%	2	9.5%		
7-8.5 (Satisfactory)	06	17%	55	50.01%	4	19.0%		
>8.5 (Poor)	02	5.7%	30	27.3%	15	71.4%		



Number of 35 patients had no diabetic retinopathy, number of 110 patients were pre-PDR and 21 patients had PDR while number of 35 patients were having no CAD by coronary angiography whereas number of 63 patients were having mild CAD, number of 50 patients had moderate CAD and 18 patients gad severe CAD out of the involved patients in this analysis. The correlation among severity of CAD and DR was evaluated as 86.68 where the value of p was 0.000 as presented in table number 02.

Table No 02: Correlation of Different Stages of Diabetic Retinopathy with Severity of Coronary Artery Disease

VARIABLES		No CAD	Mild CAD	Moderate CAD	Severe CAD	X2-value	P-value
DR	NDR	20	15	0	0	86.68	0.000
	Pre PDR	15	48	44	3		
	PDR	0	0	6	15		



The chi-square outcomes for individual matching of no CAD by no DR got to be common almost that is 55.9 where the value of p was 0.001. the outcomes of pre-PDR and mild CAD correlation and PDR against CAD correlation were 77.1 and 86.7 respectively where the value of p was 0.001 of each. Logistic regression model was used to evaluate the PORs of CAD along raising grade of DR as shown in table no 03.

Table No 03: Ratio of Prevalence Odds for Increasing Severity of CAD with Increasing Stage of DR

Diabetic Retinopathy	CAD		P-value
	POR	CI for OR	
Pre PDR	4.27	3.61-8.09	0.001
PDR	6.33	3.31-9.01	0.001
NDR	0.27	0.18-0.38	0.01

The PORs raised from 0.27 interval of time for NDR to 4.27 intervals for Pre-PDR and 6.33 intervals of time for PDR. PORs for different else comorbid situations producing CAD were almost evaluated as given in table number 04.

Table No 04: Risk Factors Affecting the Prevalence Odds Ratio of CAD

VARIABLE	CORONARY ARTERY DISEASE (CAD)	
	POR	P-value
Age	0.18	0.15
Male Sex	1.29	0.04
Insulin	0.21	0.32
Hypertension	0.81	0.04
Smoking	1.77	0.003
Family History	0.60	0.22
Low Density Lipoproteins	0.61	0.03
Triglycerides	1.69	0.01
Cholesterol	0.11	0.32
High Density Lipoproteins	0.290	0.61
HbA_{1C}	0.788	0.01

DISCUSSION:

Diabetic retinopathy is the microvascular complexity of diabetic mellitus. Diabetic patients take over a period of 5 years to 10 years to progress DR. therefore, analyses presented the correlation among CAD and diabetic nephropathy that is a late and usual complexity of DM [14-17]. Microalbuminuria exists in patients of DM with the percentage of 20.0 % to 40.0 % within the duration of 10 years to 15 years with development to explicit nephropathy from 15 years to 20 years [18]. Just the opposite, diabetic retinopathy (DR) is an initial symptom of microvascular injury usually associated with poor glycemic control and uncontrolled DM. DR is progressed in type I and type II diabetic with the percentage of 58.0 % and 80.0 % by the duration of 5 years of analyzation. Usually all patients have progressed DR by entering the proliferative stage with the percentage of 50.0 % at the age of 20 years [19]. Current finding reveals that irritation holds a major part in CAD and DR development each [20]. We found the association of severity of CAD and various phases of diabetic retinopathy through our analysis. There was no usual variance on the basis of statistics between various baseline variables of various DR groups of patients. Though, significant association was observed on the basis of our study among PDR and sever CAD, mild CAD, pre-PDR, no CAD and no DR. severity of coronary artery disease raised along raise in the stage of retinopathy. We almost evaluated the PORs of CAD by raising stages of diabetic retinopathy. PORs of CAD raised by raising the DR stages. An else strong point of our analysis was that we analyzed various comorbid situations that raise the PORs of CAD. These consist of male gender, high HBA1C levels, smoking, hypertension, high LDL levels and high TG levels got to be substantial.

The outcomes of our analysis are matching to the analyses processed by E1-Demerdash F, et al who reported stenotic ailment in PDR cases and Ohno T, et al reported that diabetics with retinopathy had substantial CAD and required CABG but gone non-verified [21,22]. These outcomes almost match with Gimeno- Orna JA, et al who explained DR to be a consequent influence of CAD [23]. Initial administration of CAD in diabetics is to raise their expectancy of life. Diabetics would be carried out continuous fundoscopic texts just not to prevent their idea but almost to evaluate severity of CAD. Any

irregular fundoscopic observations should cause the requirement of CAD screening. One of the strong points of our analysis is that we just not observed association among severity of CAD and each DR stage but almost evaluated the PORs of CAD by every DR stage. Secondly the device we processed to evaluate the severity of CAD is coronary angiography which is a benchmark. The analysis almost had some restrictions consisting of the issue that angiographic and ophthalmoscopic analyses were on the basis of analyzer. Secondly, it's a single center analysis with a moderate sampling size.

CONCLUSION:

We concluded in this analysis that Diabetic Retinopathy (DR) is just not highly related to coronary artery disease but we almost found that a maximum DR stage is correlated with a worsening CAD severity. A most severe CAD raising the odds of CAD by 2.27 times detected at higher stage of retinopathy.

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