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PARAMETRIC COMPARISON OF DIABETIC AND NON-DIABETIC CONDITION IN CORONARY ARTERY DISEASE PATIENTS UNDERGOING PCI

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ABSTRACT

Background: Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The presence of Type 2 diabetes mellitus (T2DM) is associated with severe and diffuse coronary artery disease. In addition, it is also associated with inferior outcomes following coronary revascularization compared to patients without diabetes mellitus. **Method:** Patients with stable coronary artery disease undergoing percutaneous coronary intervention (PCI) in the presence of type 2 diabetes mellitus were selected for the study and were grouped into two categories: Group 1 (non-DM) and Group 2 (DM). Various parameters like baseline and clinical characteristics, lab investigations, and patient history were studied and noted. **Result:** Among 344 CAD patients, it was found that 42.15% were non-diabetic patients and 57.84% of them were diabetic patients. Abnormalities were seen in parameters like BMI, triglyceride, HbA1C, cardiac markers, and hemoglobin. **Conclusion:** The patients with diabetes may have abnormal parametric values that have an adverse effect on outcome compared to non-diabetic patients. Finally, diabetes is considered a major comorbidity, which leads to worse conditions in CAD patients following coronary revascularization.

KEYWORDS: Percutaneous coronary intervention, Non Insulin Dependent Diabetes Mellitus, Coronary Artery Disease.

INTRODUCTION

Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels. Type 2 diabetes (ranging from predominantly insulin resistance with relative insulin deficiency to predominantly an insulin secretory defect with

insulin resistance) accounts for 90–95% of those with diabetes, previously referred to as non-insulin dependent diabetes, or adult-onset diabetes, and encompasses individuals who have insulin resistance and usually have relative insulin deficiency at least initially and often throughout their lifetime.[1] Coronary heart disease (CHD), also known as coronary artery disease (CAD), is caused by the buildup of plaque in the arteries that supply oxygen-rich blood to the heart. Plaque, a mixture of fat, cholesterol, and calcium deposits, can build up in the arteries over many years. Over time, this plaque can cause the narrowing and hardening of the coronary arteries, a condition called atherosclerosis.[2] A non-surgical procedure known as Percutaneous Coronary Intervention (PCI, formerly known as angioplasty with stent) uses a catheter, a thin flexible tube, to place a small structure known as a stent to open up blood vessels in the heart that have narrowed due to plaque buildup, a condition known as atherosclerosis.[3] A study was conducted to investigate whether the presence of diabetes mellitus is associated with severe and diffuse coronary artery disease following PCI and in addition, about the parameters difference between diabetic and non-diabetic patients patient.[4,5]

MATERIALS AND METHODS

This study focuses on the severity of CAD among diabetic patients. And also to compare the various parameters of CAD patients undergoing PCI procedures in diabetic and non-diabetic conditions. Categorized patients into 2 groups according to CAD with and without DM. As per the American Association of Clinical Endocrinology, HbA1c greater than 6.5% is included under diabetics.

Group 1 (NON-DIABETIC): Cases presenting with CAD that are non-diabetic or not fulfilling ADA criteria.
Group 2 (DIABETIC): Previous known diabetic or first time detected diabetic by American Diabetes Association (ADA) criteria presenting with CAD. Assessment of various parameters like patient history, demographic and clinical characteristics, and lab investigations (cardiac markers, lipid profile, other parameters) were done. Continuous variables are presented as mean and standard deviation. Categorical variables are presented as frequencies (percentages). Applying two sample t-test to find out whether the parameters significantly influence the severity and outcome of coronary artery disease. P-values of <0.05 were accepted as significant.

Comparison is done by two sample t-test by setting up the related hypothesis (H0: Presence of T2DM in patients is not associated with worse outcomes, H1: Presence of T2DM in patients is associated with worse outcomes).

INCLUSION CRITERIA

CAD patients with diabetes mellitus undergoing coronary revascularization procedure (PCI), age ≥ 18.

EXCLUSION CRITERIA

Type I diabetes mellitus
Gestational diabetes mellitus
Other endocrine disorders like pheochromocytoma

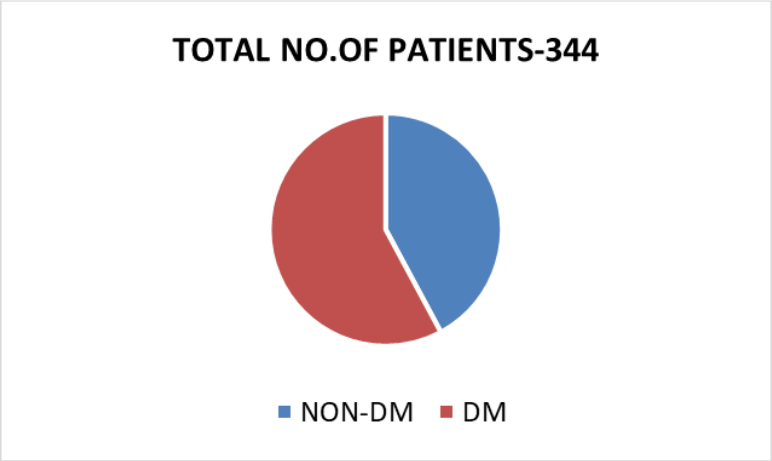

Figure 1: Prevalence of Type 2 diabetes mellitus among 344 CAD patients undergoing PCI. Of which 42.15% of them were non-diabetic patients, 57.84% were diabetic patients.

RESULT

In total, among 344 patients, 199 were found to be diabetic (Group 2) and the remaining 145 were non-diabetic (Group 1). Figure 1. The demographic characteristics of the study population and result are shown in Table 1. Age (56.44±11.21 vs. 59.14±9.36, p = 0.0082), Height (164.50±7.73 vs. 162.16±8.003, p = 0.0125), and BMI (25.67±3.76 vs. 26.65±5.01, p = 0.0526) were found to be significant. The study also showed male predominance (282 of 344) in both the non-DM and DM groups than females (62 of 344). Table 2 summarizes data on clinical parameters like heart rate and blood pressure in between the two groups. The prevalence of hypertension (42.06% vs. 53.26%), dyslipidemia (8.27% vs. 11.55%), H/O of CVA (2.06% vs. 3.51%), H/O of CKD (2.75% vs. 4.02%), H/O of PCI (8.27% vs. 10.55%), and H/O of CABG (3.44% vs. 4.02%) were high in Group 2. Table 4 shows increased levels of cardiac markers like CK NAC- (91.07±36.25 vs 72.46±35.25, p = 0.0537) and CKMB- (2.09±0.82 vs 1.32±0.801, p = 0.0045) were observed in group 1. The laboratory investigations are summarized in Table 4. Higher triglyceride levels (143.07±71.14 vs. 183.32±84.80, p = 0.0062) and glycosylated hemoglobin A1c (HbA1C) levels (6.38±1.503 vs. 8.56±2.03, p = 0.0001) were observed in Group 2.

Table 1: Demographic Characters.

VARIABLES	GROUP 1(n=145)	GROUP 2(n=199)	p value
AGE	56.44±11.21	59.14±9.36	**0.0082**
SEX	124(M),21(F)	157(M),41(F)	
HEIGHT(cm)	164.50±7.73	162.16±8.003	**0.0125**
WEIGHT(kg)	69.54±11.405	69.24±10.39	0.4207
BMI(kg/m²)	25.67±3.76	26.65±5.01	**0.0526**

Table 2: Clinical Parameters.

VARIABLES	GROUP 1(n=145)	GROUP 2(n=199)	p value
HEART RATE(BPM)	78.46±14.08	80.38±11.50	0.0853
SYSTOLIC BP	133.92±21.69	137.57±22.37	0.0681
DIASTOLIC BP	77.57±11.49	77.03±10.87	0.3336
MEAN BLOOD PRESSURE (mmHg)	99.75±14.03	100.62±15.76	0.3015

Table 3: Patient History.

VARIABLES	GROUP 1(n=145)	GROUP 2(n=199)
STEMI	0.69%	1.01%
UA	8.27%	15.57%
RECENT MI (90 DAYS)	61.37%	59.29%
NSTEMI	22.06%	17.08%
K/C/O CAD	10.34%	19.59%
CARDIOGENIC SHOCK	0.69%	2.01%
DM	0%	100%
HYPERTENSION	42.06%	53.26%
DYSLIPIDEMIA	8.27%	11.55%
SMOKER	2.06%	2.01%
EX-SMOKER(1YEAR)	0.69%	0.50%
ALCOHOLIC	1.37%	1.00%
EX-ALCOHOLIC	0.69%	0%
H/O CVA	2.06%	3.51%
H/O COPD	0.69%	0.50%
H/O CKD	2.75%	4.02%
H/O PVD	0%	1.51%
H/O PCI	8.27%	10.55%
H/O CABG	3.44%	4.02%

Table 4: Laboratory Investigation.

VARIABLES	GROUP 1(n=145)	GROUP 2(n=199)	p value
TGL(mg/ dl)	143.07±71.14	183.32±84.80	**0.0062**
TC(mg/ dl)	160.12±48.13	159.72±54.47	**0.488**
HDL(mg/ dl)	38.06±10.78	36.85±11.47	0.3015
LDL(mg/ dl)	110.77±44.01	106.20±48.56	0.3192
Hb (g/ dl)	13.40±2.21	13.16±2.02	0.2177
PLATELETS (lak/ Cmm)	2.99±2.95	2.94±0.78	0.4404
UREA(mg / dl)	25.46±11.001	26.07±11.43	0.3336
CREATININE (mg / dl)	1.06±0.51	0.85±0.47	**0.0001**
HbA1C%	6.38±1.503	8.56±2.03	**0.0001**
CK NAC(IU/L)	91.07±36.25	72.46±35.25	**0.0537**
CKMB(ng/ ml)	2.09±0.82	1.32±0.801	**0.0045**
TROPONIN(ng/ ml)	0.15±0.13	0.14±0.13	0.3974

DISCUSSION

Cardiovascular diseases, including CAD, are more common among diabetic patients than non- diabetic patients. In the present study, there was a significant difference between age in two groups (diabetic and non-diabetic).[6] Diabetic group were older. In comparisons with the sex ratio, male candidates were found to be higher in two groups than females. Baseline characters like BMI (p = 0.0526) in the study showed a higher risk of CAD in diabetic patients. Martin-Timon et al.[7] (2014) stated most of the excess risk and worse outcomes are associated with BMI. According to the study, smoking (2.06% vs. 2.01%) and alcohol consumption (1.37% vs. 1.00%) are significantly associated with a worse outcome. Uma Mahesh et al. (2014)[8] concluded that smoking and heavy alcohol consumption were significantly associated with CVD. Hypertension and dyslipidemia were observed to be higher in diabetic patients than in non-diabetic patients.

Our study findings stated that HbA1c (p = 0.0001) with a range of 6.5 or greater is associated with worse outcomes in CAD patients. Cavero-Redondo et al. (2007) said that HbA1c is a reliable risk factor of all-cause and cardiovascular mortality in both diabetics and non-diabetics, ranging from 6.0% to 8.0% in people with diabetes and from 5.0% to

6.0% in those without diabetes.[9] Group 2 patients also had a history of PCI and CABG. H/O of chronic kidney disease is also found to be relatively in higher percentage in Group 2 (Diabetic). The presence of hypertension and also its duration were found to be high in the diabetic group. H/O CVA (2.06% vs. 3.51%) is associated with worse outcomes, which is also stated by Jiang et al. (2017). Both history of CVA and history of MI in DM patients were more associated with worse outcomes and a higher incidence of adverse events.[10]

In the study, serum creatinine ($p = 0.0001$) is associated with worse outcomes in DM patients. Accordingly, Jiang et al. (2017) found that DM patients with high- levels of serum creatinine were more likely to have poor prognostic outcomes and a higher incidence of adverse events.

Lipid profile components like TG ($p = 0.0062$) are associated with worse outcomes of CAD with T2DM. Ye X, Kong W, et al.[11] (2019) stated that an increase in the TG concentration is exposed to a higher risk of CVD events, and an increased TG level tends to be associated with an increase in the risk of incident CVD in T2DM. HDL to be found less in Diabetic patients than in non diabetic group which also significantely worsens the outcome.

CONCLUSION

In summary, the results of our study suggest that diabetic patients have a high coronary risk equivalent. Various parameters studied show that the abnormality may lead to worse PCI outcomes. Basic parameters like demographic characters that were observed in two groups may lead to a worse outcome in diabetic patients, whereas clinical parameters did not have any effect on the patients. The patient history towards various conditions was also taken into account since diabetic patients with histories had complications like H/O of alcohol, smoking, hypertension, CKD, PCI, and CABG. General blood investigations studied in CAD patients like cardiac markers, lipid profile, HbA1C, and creatinine mostly show abnormalities in patients with diabetes than non-diabetic patients, which may lead to a worse PCI outcome. From the study, the patients with diabetes may have abnormal parametric values that have an adverse effect on outcome compared to non-diabetic patients. Finally concluding that diabetes is a major comorbidity, which may lead to worse conditions in CAD patients following PCI.

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