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ORIGINAL ARTICLE

Diabetic Population (Type 1 Versus Type 2) Characteristics and Severity of Coronary Artery Disease in Chronic Coronary Syndrome

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ABSTRACT

Background: Heart disease is the primary cause of death for diabetics. Obesity, systemic hypertension, and hyperlipidemia factors frequently found in diabetic patients have been connected to an increased risk of coronary artery disease (CAD). In order to improve care and lower CAD in diabetic individuals with chronic coronary syndrome (CCS), this study aims to quantify the severity of CAD. **Methods**: out of 140 diabetic patients with chronic coronary syndrome,70 being type 1diabetes mellitus (T1DM) and 70 are type 2 diabetes mellitus (T2DM), undergone percutaneous coronary angiography (PCI) to evaluate the severity of coronary artery by using syntax and Gensini scores. **Results**: type 2 diabetes mellitus (DM) were older, 82.9% were males ($p<0.001$), had higher systolic (150±19.3vs 131.8±14.8) $p<0.001$ and diastolic (86.4 ± vs 82.1 ± 7.14) $p=0.003$ blood pressure compared to type 1 DM also, T2DM had higher levels of triglycerides (99.2±27vs 87.1±14.9) $p=0.003$, higher lower density lipoprotein (LDL) (172.1±32.3vs 158.2±21.7) $p=0.001$, and poor glycemic control (34.3%vs 11.4%) $p=0.002$ compared to T1DM Type 2 diabetes mellitus revealed higher Syntax ($p<0.001$) and Gensini ($p<0.001$) scores in comparison to type 1 diabetes mellitus. **Conclusion**: Type 2 diabetes mellitus patients had more sever and a complex coronary artery disease than those with type1 diabetes mellitus.

Keywords: Chronic coronary syndrome; Coronary angiography; Diabetes mellitus

INTRODUCTION

Diabetes mellitus (DM) is considered the second most prevalent disease worldwide after cardiovascular disorders it is characterized by acute and chronic complications Heart disease is known to be the most leading cause of death in diabetics Dyslipidemia is found in almost all individuals with diabetes, and those diabetics with elevated cholesterol levels seems to exhibit the highest risk for developing coronary artery disease more than people without diabetes by two to three times [1].Diabetic patients are at risk for coronary atherosclerosis due to vascular dysfunction brought on by the metabolic abnormalities associated with the disease. Percutaneous coronary intervention (PCI) is used in both acute and elective settings continues to be the most popular method for reperfusion in diabetic individuals. Worse angiographic and clinical outcomes were noted in diabetic patients who undergone PCI inspite of introducing of advanced interventional techniques and new generation drug-eluting stents (DES) as reported by researches, which include stent thrombosis, target lestion revascularization (TLR), target vessel failure (TVF), and major adverse cardiovascular and cerebrovascular events (MACCE)[2].In addition to having a high prevalence, diabetes is associated with severe CAD. According to reports, the prevalence of CAD in the general population is between

1.6% and 4.1%, in contrast, it ranges from 9.5% to 55% in those with diabetes [3].

Other variables that are frequently linked to diabetic individuals, such as obesity, systemic hypertension, and hyperlipidemia, have also been linked to this increased risk of CAD. Recent research has demonstrated that diabetes mellitus has a separate impact from cardiovascular risk factors [4].More recent angiographic and histologic studies have cast doubt on a previously demonstrated association between diabetes and increased CAD severity, which may be explained by other confounding risk factors that commonly affect diabetic patients, such as obesity, dyslipidemia, and hypertension [5].

AIM OF THE STUDY

This study was carried out to evaluate the extent of coronary artery disease (CAD), and guiding for the best management of chronic coronary syndrome (CCS) in diabetic populations.

METHODS

A total of 140 diabetic patients with chronic coronary syndrome enrolled in this cross-sectional comparative study from January to June 2024, undertaken at Zagazig university cardiology department clinic, were divided into two groups; group (A) includes 70 patients with type 1 diabetes mellitus, a group (B) includes 70 patients with type 2 diabetes mellitus.

Ethical approval: Approval was taken from the research ethical committee and the institutional review board (IRB #11297-19/11-2023) of Zagazig University's Faculty of Medicine. The work has been carried out in accordance with The Code of Ethics of the World Medical Association Declaration of Helsinki) for studies involving humans. All procedure steps were explained for each patient. A written informed consent was taken from the patients with explanation of the procedure, possible hazards. Ensure patient confidentiality and anonymization of data. Adhere to ethical guidelines for retrospective research.

Inclusion criteria: Diabetes mellitus patients (type 1,type 2) with chronic coronary syndrome

Exclusion criteria: Patients with ACS, Patients with either CABG or previous PCI , Patients with severe congestive heart failure (CHF), Patients with severe renal and hepatic diseases and Patients with previous stroke with significant residual deficit or other planned surgical procedure unrelated to coronary revascularization.

Sample size: According to two-sided confidence level 95%, power of test 80% and percent of multivessel disease in type 2 was 48.7% and type 1 was 25.5%., so the sample size was 140 cases .

Demographic information was gathered, and DM was diagnosed when HBA1c was ≥ 6.5%, fasting plasma glucose was > 126 mg/dl, and 2-H plasma glucose was ≥ 200 mg/dl in a 75-g oral glucose tolerance test. serum urea, creatinine, liver function test, random blood sugar (RBS), HbA1C, lipid profile, prothrombin time (PT), activated partial thromboplastin time (APTT), and international normalized ratio (INR) are among the laboratory tests. Using their HbA1c control, we categorized the diabetic individuals as having good control (<7), fair control (5-7), and poor control (>8.5).

At rest and in the supine position, a 12-lead electrocardiography(ECG) was recorded with a filter setting of 0.05–150 Hz, at a rate of 25mm/s, and calibrated at 10mV/cm.in compliance within the American Society of Echocardiography, a transthoracic echocardiography was carried out before the procedure [6].

Subsequent to sufficient preparation, coronary angiography was carried out using the conventional Judkin's procedure. Stable angina and post-infarct angina were the indications for coronary angiography. Both types of diabetes with CCS were compared in terms of angiographic characteristics and additional treatment needs. Lesion`s severity that`s observed in angiography were evaluated by both Gensini and SYNTAX (the combination of

heart surgery and PCI with taxus) scores. The complexity of the coronary artery disease were determined by the SYNTAX score (SS) which is an angiographic grading system scores the vessels that`s ≥1.5mm with luminal obstruction ≥ 50% this calculation score is available at (www.syntaxscore.com) lastly, patients defined as having a low (0-22), intermediate (23-32), or high (≥33) [7].

Determination of severity of the coronary artery disease is caculated by a Gensini score, 1 is given for constriction of 1-25%, 2 for narrowing of 26-50%, 4 for 51-75%, 8 for 76-90%, 16 for 91-99%, and 32 for a fully blocked artery. The severity of the coronary artery is then taken into account when multiplying this score by a factor. The patients were classified into three groups Gensini score <11 points), (Gensini score 11-38 points), (Gensini score >38 points) [8]**.**

Statistical analysis

SPSS v28 was used to conduct statistical analysis (IBM Inc., Armonk, NY, USA). The mean and standard deviation (SD) of the quantitative variables were displayed, and the two groups were compared using the unpaired Student's t-test. The Chi-square test was used to analyze the qualitative variables, which were expressed as frequency and percentage (%). According to the type of data qualitative represent as number and percentage , quantitative continues group represent by mean ± SD, the following tests were used to test differences for significance;. Differences between quantitative independent multiple by independents sample t test (for normally distributed data) and Mann Whitney test (for not normally distributed data) were used, One-way ANOVA test (F) was used to test differences when more than two independent groups were present and variances were equal, while Kruskal-Wallis test (KW) was used when equal variances were not present. there are two assumptions for ANOVA that keep showing up - homogeneity of variance and normality. Homogeneity of variance is the assumption that each population mean has the same variance The assumption of normality means that the populations that each group is drawn from have normal distributions. Together, these two assumptions assume that for ANOVA, every sample is drawn from a normal distribution with the same population variance, even if the population means aren't the same Logistic regression useful in the prediction of the presence or absence of an outcome based on a set of independent variables. It is similar to a linear regression model but is suited when the dependent variable is qualitative (categorical).. Statistical significance was defined as P value < 0.05.

RESULTS

Table (1) shows a statistically significant difference between the studied groups regarding demographic data, as type 2 DM patients were older than type 1 DM patients. Also, most of the type 2 DM patients (82.9%) were males, while most of the type 1 DM patients (74.3%) were females *(P<0.001)*. Furthermore, type 2 DM patients had a higher age of onset of DM and a longer duration of DM when compared to type 1 DM patients. There was a statistically significant difference between the studied groups as regards blood pressure, as type 2 DM patients had a higher SBP and a higher DBP when compared with type 1 DM patients. There was a statistically significant difference between the studied groups as regards lipid profile, as type 2 DM patients had a higher level of triglycerides and LDL when compared with type 1 DM patients. While type 1 DM patients had a higher HDL level when compared to type 2 DM patients Table (2) showed that a statistically significant difference between the studied groups as regards syntax score, as type 2 DM patients had a higher syntax score when compared with type 1 DM patients. As regards syntax score grading, (72.9%) of type 1 DM patients had a low syntax score in comparison to (7.1%) of

type 2 DM. While (14.3%) of type 2 DM patients had an intermediate syntax score in comparison to (2.9%) of type 1 DM patients. Also, (78.6%) of type 2 DM patients had a high syntax score in comparison to (24.3%) of type 1 DM patients. Table (3) shows a statistically significant difference between the studied groups as regards Gensini score, as type 2 DM patients had a higher Gensini score when compared with type 1 DM patients (P<0.001). As regards Gensini score grading, (20%) of type 1 DM patients had a Gensini score of < 11 points in comparison to (1.4%) of type 2 DM (P<0.001). Also, (40%) of type 1 DM patients had a Gensini score of 11 to 38 points in comparison to (8.6%) of type 2 DM patients (P<0.001). While (90%) of type 2 DM patients had a Gensini score of > 38 points in comparison to (40%) of type 1 DM patients (P<0.001). Table (4) shows a statistical significant positive correlation between syntax score with age, age of onset of DM, duration of DM, SBP, DBP, cholesterol, triglycerides , LDL, RBS, HbA1C and Gensini score. While there was a statistical significant negative correlation between syntax score with HDL and EF. Also, there was a statistical significant positive correlation between Gensini score with age, age of onset of DM, duration of DM, SBP, DBP, cholesterol, triglycerides, LDL, RBS and HbA1C. While there was a statistical significant negative correlation between Gensini score with HDL and EF. Table (5) shows a statistically significant association between glycemic control and syntax and Gensini scores, as patients with poor glycemic control had a higher syntax score and a higher Gensini score when compared with patients with good and fair glycemic control (P<0.001). Table (6) shows that after applying logistic regression analysis for predictors of high syntax score, old age, type 2 DM, age of onset of DM, duration of DM, HbA1C and Gensini score can be used as independent factors for predicting high syntax score. Table (7) shows that after applying logistic regression analysis for predictors of Gensini score > 38 points, old age, male sex, type 2 DM, age of onset of DM, duration of DM, RBS, HbA1C and Syntax score can be used as independent factors for predicting Gensini score > 38 points.

Table (1): Demographic data among the studied groups

Variables		Type 1 DM (n=70)	Type 2 DM (n=70)	P Value
Age (years)	Mean ± SD	45.8 ± 7.38	65.2 ± 4.08	**<0.001**[1]
Sex (n. %)	Male	18 (25.7%)	58 (82.9%)	**<0.001**[2]
	Female	52 (74.3%)	12 (17.1%)	
Age of onset of DM (years)	Mean ± SD	33 ± 5.88	46.6 ± 5.3	**<0.001**[1]
Duration of DM (years)	Mean ± SD	12.8 ± 7.07	18.6 ± 6.27	**<0.001**[1]
Clinical data				
SBP (mmHg)	Mean ± SD	131.8 ± 14.85	150 ± 19.3	**<0.001**
DBP (mmHg)	Mean ± SD	82.1 ± 7.14	86.4 ± 7.31	**0.003**
Lipid profile				
Cholesterol (mg/dl)	Mean ± SD	172 ± 19.7	172.7 ± 30.2	0.88
HDL (mg/dl)	Mean ± SD	65.3 ± 11.5	57.9 ± 14.1	**<0.001**
LDL (mg/dl)	Mean ± SD	158.2 ± 21.7	172.1 ± 32.3	**0.001**
Blood sugar control				
RBS (mmol/l)	Median (IQR)	155.5 (38.5)	170 (58)	0.07[2]
HbA1C (%)	Mean ± SD	7.55 ± 1.19	8.32 ± 1.3	**<0.001**[1]
Glycemic control (n. %)	Good	25 (35.7%)	7 (10%)	**<0.001**[4]
	Fair	37 (52.9%)	39 (55.7%)	0.73[3]
	Poor	8 (11.4%)	24 (34.3%)	**0.002**[4]

**[1]Student T-test, [2]Fisher exact test, Non-significant: P >0.05, Significant: P ≤0.05*

**Student T-test, Non-significant*

**SBP=Systolic blood pressure, DBP=Diastolic blood pressure ,[2]Mann-Whitney U test, [3]Chi-square test, [4]Fisher exact test,*RBS=Random blood sugar, HbA1C=Glycated hemoglobin*

Table (2): Syntax score among the studied groups

Variables		Type 1 DM (n=70)	Type 2 DM (n=70)	P Value
Syntax score	Median (IQR)	8 (15.6)	33 (10.5)	**<0.001[1]**
	Range	(0 – 41.5)	(0 – 40.5)	
Syntax score grading (n. %)	Low	51 (72.9%)	5 (7.1%)	**<0.001[3]**
	Intermediate	2 (2.9%)	10 (14.3%)	**0.03[3]**
	High	17 (24.3%)	55 (78.6%)	**<0.001[2]**

**[1]Mann-Whitney U test, [2]Chi-square test, [3]Fisher exact test, Non-significant: P >0.05, Significant: P ≤0.05*

Table (3): Gensini score among the studied groups

Variables		Type 1 DM (n=70)	Type 2 DM (n=70)	P Value
Gensini score	Median (IQR)	31 (34)	89 (44.8)	**<0.001[1]**
	Range	(0 – 125)	(0 – 196)	
Gensini score grading (n. %)	< 11 points	14 (20%)	1 (1.4%)	**<0.001[2]**
	11 – 38 points	28 (40%)	6 (8.6%)	**<0.001[2]**
	> 38 points	28 (40%)	63 (90%)	**<0.001[2]**

**[1]Mann-Whitney U test, [2]Fisher exact test, Non-significant: P >0.05, Significant: P ≤0.05*

Table (4): Correlation of Syntax and Gensini scores with different parameters among the studied patients

Variable	Syntax score		Gensini score	
	r	***P***	***r***	***P***
Age	0.710	**<0.001[2]**	0.693	**<0.001[2]**
Age of onset of DM	0.386	**<0.001[1]**	0.381	**<0.001[1]**
Duration of DM	0.694	**<0.001[1]**	0.627	**<0.001[1]**
SBP	0.531	**<0.001[1]**	0.555	**<0.001[1]**
DBP	0.452	**<0.001[1]**	0.432	**<0.001[1]**
Cholesterol	0.268	**0.001[1]**	0.265	**0.002[1]**
Triglycerides	0.497	**<0.001[2]**	0.509	**<0.001[2]**
HDL	-0.339	**<0.001[2]**	-0.400	**<0.001[2]**
LDL	0.429	**<0.001[2]**	0.428	**<0.001[2]**
Total bilirubin	0.162	0.06[1]	0.118	0.16[1]
Urea	-0.065	0.45[1]	-0.025	0.77[1]
Creatinine	0.085	0.32[1]	0.089	0.29[1]
RBS	0.475	**<0.001[2]**	0.447	**<0.001[2]**
HbA1C	0.667	**<0.001[2]**	0.652	**<0.001[2]**
EF	-0.462	**<0.001[2]**	-0.459	**<0.001[2]**
Gensini score	0.881	**<0.001[2]**	-	-

**[1]Pearson correlation, [2]Spearman rank correlation test, Non-significant: P >0.05, Significant: P ≤0.05*

Table (5): Association between glycemic control and different scores among the studied patients

Variables		Good (n=32)	Fair (n=76)	Poor (n=32)	*P Value	Post-Hoc
Syntax score	Median (IQR)	6 (5.25)	23.3 (21.6)	32.3 (4.63)	**<0.001[1]**	**P1<0.001 P2<0.001 P3<0.001**
	Range	(0– 31)	(0 – 36)	(17–41.5)		
Gensini score	Median (IQR)	18 (23)	57.5 (53.5)	109.5 (41)	**<0.001[1]**	**P1<0.001 P2<0.001 P3<0.001**
	Range	(0– 84)	(0–150)	(32 – 196)		

*[1]Krusckal-Wallis test, Non-significant: P >0.05, Significant: P ≤0.05*P value=Comparison between the three groups, P1=Comparison between Good and Fair control, P2=Comparison between Good and Poor control, P3=Comparison between Fair and Poor control

Table (6): Logistic regression analysis for predictors of high syntax score

Variables	Univariate analysis		Multivariate analysis	
	P value	Odds (CI 95%)	P value	Odds (CI 95%)
Age	**<0.001**	1.16 (1.11 – 1.21)	**<0.001**	1.21 (1.11 – 1.33)
Male sex	**<0.001**	3.67 (1.82 – 7.39)	0.54	1.39 (0.48 – 4.08)
Type 2 DM	**<0.001**	11.43 (5.19 – 25.19)	**0.04**	8.45 (4.78 – 8.25)
Age of onset of DM	**<0.001**	1.08 (1.03 – 1.13)	**0.01**	1.12 (1.02 – 1.22)
Duration of DM	**<0.001**	1.24 (1.16 – 1.33)	**0.04**	1.09 (1.004 – 1.2)
SBP	**<0.001**	1.06 (1.03 – 1.09)	0.25	1.02 (0.94 – 1.05)
Diastolic	**<0.001**	1.12 (1.06 – 1.19)	0.85	1.21 (0.18 – 8.25)
Cholesterol	**0.01**	1.02 (1.004 – 1.03)	0.11	0.98 (0.96 – 1.00)
Triglycerides	**<0.001**	1.04 (1.03 – 1.06)	0.81	1.004 (0.98 – 1.03)
ALT	0.71	1.01 (0.96 – 1.06)	-	-
Total bilirubin	**0.02**	4.67 (1.25 – 17.37)	0.71	1.15 (0.86 – 5.23)
HbA1C	**<0.001**	7.4 (3.75 – 14.6)	**<0.001**	5.17 (2.34 – 11.43)
EF	**<0.001**	0.83 (0.77 – 0.89)	0.16	0.91 (0.82 – 1.04)
Gensini score	**<0.001**	1.09 (1.06 – 1.12)	**<0.001**	1.08 (1.05 – 1.11)

Table (7): Logistic regression analysis for predictors of Gensini score > 38 points

Variables	Univariate analysis		Multivariate analysis	
	P value	Odds (CI 95%)	P value	Odds (CI 95%)
Age	**<0.001**	1.15 (1.1 – 1.2)	**0.01**	1.14 (1.03 – 1.26)
Male sex	**<0.001**	5.02 (2.35 – 10.73)	**0.02**	2.65 (1.19 – 5.89)
Type 2 DM	**<0.001**	12.72 (5.11 – 31.74)	**0.006**	9.65 (5.45 – 12.39)
Age of onset of DM	**<0.001**	1.08 (1.05 – 1.19)	**0.003**	1.16 (1.05 – 1.29)
Duration of DM	**<0.001**	1.25 (1.15 – 1.34)	**0.02**	1.11 (1.01 – 1.19)
SBP	**<0.001**	1.06 (1.03 – 1.08)	0.97	0.99 (0.95 – 1.05)
Diastolic	**<0.001**	1.15 (1.07 – 1.23)	0.11	0.91 (0.82 – 1.02)
Cholesterol	**0.008**	1.02 (1.005 – 1.04)	0.55	0.99 (0.95 – 1.03)
Triglycerides	**<0.001**	1.05 (1.03 – 1.08)	0.62	1.01 (0.98 – 1.04)
HDL	**<0.001**	0.94 (0.92 – 0.97)	0.71	0.99 (0.95 – 1.04)
LDL	**<0.001**	1.06 (1.03 – 1.09)	0.09	0.97 (0.93 – 1.01)
Total bilirubin	0.27	1.98 (0.59 – 6.63)	-	-

Variables	Univariate analysis		Multivariate analysis	
	P value	Odds (CI 95%)	P value	Odds (CI 95%)
HbA1C	**<0.001**	7.68 (3.69 – 16.1)	**<0.001**	5.31 (2.11 – 13.39)
EF	**<0.001**	0.81 (0.74 – 0.89)	0.19	0.88 (0.72 – 1.07)
Syntax score	**<0.001**	1.33 (1.2 – 1.48)	**<0.001**	1.35 (1.18 – 1.55)

DISCUSSION

Diabetes mellitus is a significant risk factor for CAD, impacting cardiovascular health in several ways. DM promotes the development of atherosclerosis, the buildup of plaques in the arteries that leads to CAD. DM is associated with chronic low-grade inflammation, which contributes to endothelial dysfunction. Moreover, DM frequently disrupts lipid metabolism, leading to abnormal lipid profiles, such as high levels of triglycerides and low levels of HDL cholesterol, which are risk factors for CAD [9].

This study aimed to estimate the severity and extent of CAD, and to provide better management and reducing of CAD in diabetic patients with chronic coronary syndrome (CCS). And also, to evaluate the different impact of (type1) versus (type2) DM on the severity of CAD in CCS patients.

The present study showed statistically significant difference between the studied groups regarding demographic data, as type 2 DM patients were older than type 1 DM patients. This came in agreement with Mookpaksacharoen et al., [10] as type 2 DM patients were significantly older than type 1 DM patients.The present study showed statistically significant difference between the studied groups as regards blood pressure, as type 2 DM patients had a higher SBP and a higher DBP when compared with type 1 DM patients. Similar results were reported by Hockett et al., [11]. Both types of DM increase the risk of atherosclerosis, but the mechanisms and contributing factors can differ. Type 1 DM patients often face a higher risk due to the longer duration of the disease, while Type 2 DM patients have a higher risk due to the combination of metabolic syndrome factors.Regarding lipid profile assessment, this study showed statistically significant difference between the studied groups as type 2 DM patients had a higher level of triglycerides and LDL when compared with type 1 DM patients. While type 1 DM patients had a higher HDL level when compared to type 2 DM patients. Despite inclusion of younger patients, same results were obtained in the study conducted by Kim et al., [12].In the present study, there was statistically significant difference between the studied groups as regards HbA1C and glycemic control, as type 2 DM patients had higher HbA1C levels and hence worse glycemic control when compared to type 1 DM patients. Different results were reported by Hockett et al., [11] as type 1 DM patients had higher HbA1C levels compared to type 2 DM patients. The levels of HbA1C are subjective as it is totally dependent on glycemic control and compliance of patients with their medications.This study showed no significant difference between the studied groups as regards ejection fraction. While specific studies directly comparing EF between type 1 DM and type 2 DM are limited, it is generally observed that type 2 DM patients are at a higher risk of developing heart failure with reduced ejection fraction due to the combined effects of metabolic syndrome, hypertension, and obesity [13].The current study revealed statistically significant difference between the studied groups as regards syntax score and Gensini score, as type 2 DM patients had a higher syntax score and higher Gensini score when compared with type 1 DM patients.

To the best of our knowledge, this study was the first to compare syntax score and Gensini score between type 1 and type 2 DM. The syntax score is an anatomical scoring system used to evaluate the complexity of CAD based on coronary angiograms [14]. For patients with diabetes, the syntax score is particularly important because diabetes is associated with more complex and diffuse CAD, leading to higher morbidity and mortality from cardiovascular disease [15]. Diabetic patients typically have more complex and diffuse CAD, leading to higher syntax score [16].

As regards Gensini score, it is a clinical tool used to quantify the severity of CAD based on coronary angiography. It takes into account both the degree of artery narrowing and the specific locations of these narrowings [17]. The Gensini score is particularly relevant for

patients with diabetes because it helps quantify the severity of CAD [18]. Studies have shown that diabetic patients generally have higher Gensini scores compared to non-diabetics, indicating more severe and extensive CAD [19]. Moreover, the severity of CAD, as measured by the Gensini score, often correlates with the duration of diabetes. Longer duration of diabetes is associated with higher Gensini scores[20].

In the current study there was significant positive correlation between either of syntax score or Gensini score with age, age of onset of DM, duration of DM, SBP, DBP, cholesterol, triglycerides, LDL, RBS and HbA1C. While there was a significant negative correlation between either of syntax score or Gensini score with HDL and EF. Syntax score and Gensini score were positively correlated. Moreover, there was statistically significant association between glycemic control and syntax and Gensini scores, as patients with poor glycemic control had a higher syntax score and a higher Gensini score.

Şahin et al., [21] reported that higher total cholesterol and LDL cholesterol levels are strongly correlated with higher syntax scores. In addition, Özmen et al., [22] found that elevated triglyceride levels and higher LDL levels are associated with higher syntax score. Zhao et al., [23] reported that elevated RBS levels and higher HbA1C levels show a positive correlation with higher syntax scores.

As for negative correlations, agreeing results were also reported. Higher HDL levels are associated with lower Gensini scores, indicating less complex CAD [24]. Also, Seddik & Hassan, [25] found that there is a significant negative correlation between the Gensini score and LVEF. Lower ejection fractions, which indicate poorer heart function, are associated with higher Gensini scores, reflecting more complex and severe CAD.

Finally, after applying logistic regression analysis for predictors of high syntax score and high Gensini score (> 38 points), old age, type 2 DM, age of onset of DM, duration of DM, HbA1C can be used as independent factors for predicting high syntax score and high Gensini score. Both scores measure different aspects of CAD severity, but they often correlate well with each other. Higher Gensini scores, which indicate more severe and extensive coronary lesions, are typically associated with higher syntax scores, reflecting more complex CAD [8]. This significant association helps in comprehensive risk stratification and treatment planning. For instance, patients with high scores on both scales may require more aggressive management and closer monitoring [26].Matos et al., [27] reported that the Gensini score is a better indicator of the total atherosclerotic load because it looks at lesions with as little as 25% luminal stenosis. This is different from the SYNTAX score, which does not include occlusive lesions with less than 50% stenosis. Additionally, according to intracoronary ultrasonography results, the Gensini score significantly correlates with both the average plaque burden and the plaque area. On the other hand, in individuals with CCS, both Gensini and SYNTAX scores have a small predictive value for the occurrence of cardiovascular events. Combining these scores improves their predictive value, especially for lower-risk scores .Rashid [28] found that there was significant association between HbA1c levels and CAD severity in type 2 diabetic patients with MI. Elevated HbA1c levels are strongly linked to increased CAD severity, highlighting the importance of tight glycemic control in managing CAD in diabetic patients. This study suggests that HbA1c levels can serve as a preliminary marker for early detection of high-risk acute CAD patients, enabling prompt interventions and enhanced clinical outcomes.

El Kersh [29] concluded that the severity of coronary artery lesions in diabetic patients was substantially linked with their HbA1c levels. In addition, the HbA1c score remained a strong predictor of the complexity of coronary artery lesions even when other risk indicators were taken into consideration. In general, people with diabetes have a worse prognosis, but this can be mitigated with effective HbA1c treatment. HbA1c levels have shown promise as a predictor of the development of coronary artery disease with complex lesions. Patients with HbA1c levels that are closer to normal have a markedly reduced chance of developing complicated coronary artery lesions.Boyraz B, Peker [30] found that both Gensini score and SYNTAX score systems can successfully predict the heart team's choice of revascularization method, and the SYNTAX score can predict the decision better than the Gensini score. the Gensini score system can predict coronary plaque burden better than the SYNTAX score, it was found to be more

unsuccessful in the selection of coronary revascularization compared to the SYNTAX score

Limitations:

This study demonstrated some limitations. It was a single-center study, Relatively small number of patients which may not be representative of the general population and could impact the precision of the diagnostic accuracy estimates.

Conclusions:

Higer SYNTAX and gensini scores are more pronounced in T2DM than T1DM. Age at which diabetes first discovered, how long it lasts, SBP, DBP, LDL, triglycerides, cholesterol, RBS, and HbA1C were the factors that exhibited a significant positive connection with either the Gensini score or the syntax score.T2DM patients had more complex coronary artery disease especially if they are old, had there diabetes for long time, had high HbA1C,and high SYNTAX and Gensini scores in comparison with T1DM.

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