

Original Article

Evaluation of the Glycosylated Haemoglobin as a Predictor of Severity of Coronary Artery Disease in Non-diabetic NSTEMI Patients

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Abstract:

Key Words :
IHD, coronary artery, NSTEMI, HbA1c, Gensini score.

Background: Glycated hemoglobin (HbA1c) values reflect two to three months average endogenous exposure haemoglobin to glucose including postprandial spikes and have low intra-individual variability particularly in non-diabetic patients. Elevated HbA1c is regarded as an independent risk factor for coronary artery disease (CAD) in patients with or without diabetes mellitus (DM). The purpose of this study is to determine the correlation between the level of HbA1c and the severity of coronary artery disease in non-diabetic non ST elevation myocardial infarction (NSTEMI) patients.

Methods: This observational study was carried out with total of 64 non-diabetic patients with a history of NSTEMI. Patients were divided into 2 groups based on HbA1c - one group having HbA1c $\geq 5.7 - 6.4\%$ (High risk group) and another group with HbA1c $< 5.7\%$ (Low risk group). Severity of CAD was assessed using Gensini score derived from coronary angiographic data. Gensini score < 36 points was regarded as mild coronary artery disease and Gensini score 36 points as moderate to severe coronary artery disease. Then patients with high and low risk HbA1c groups were correlated with severity of CAD.

Results: Over 55.5% patients with HbA1c in high-risk group (5.7 – 6.4%) had severe CAD as opposed to 28.6% patients with HbA1c in low-Risk group ($< 5.7\%$). The individuals with high-risk group of HbA1c was 3.1 (95% of CI = 1.1 – 8.9) times more likely to have severe CAD than those with HbA1c $< 5.7\%$ ($p = 0.031$). Spearman correlation between HbA1c and Gensini score depicted that the two variables exhibit a linear relationship indicating that Gensini score rises parallel with the rise of HbA1c ($r = 0.289$, $p = 0.021$).

Conclusion: The study concluded that over half of the non-diabetic, NSTEMI patients with high-risk range HbA1c are likely to have severe CAD than those with HbA1c within normal range.

(*Cardiovasc j* 2022; 15(1): 26-35)

Introduction:

Coronary artery disease is the leading cause of morbidity and mortality throughout the world. The most common form of CAD is the myocardial infarction. It is responsible for over 15% of mortality each year.¹ The burden of cardiovascular disease (CVD), especially the CAD is increasing at a greater rate in South Asia than in any other region globally.² Among the NCDs, cardiovascular disease is probably the most important cause of

mortality and morbidity in Bangladesh.³ According to the “Health Bulletin 2017” CVDs have an age-standardized mortality rate of 411 per 100,000 people.⁴ Advancing age, male sex, hypertension, diabetes mellitus, dyslipidemia and smoking are the independent risk factors for CAD.⁵

Among the known risk factors for cardiovascular disease, DM ranks as one of the most potent risk factors. The excess risk for cardiovascular disease

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is 2 to 8-fold higher in patients with DM compared to non-diabetic individuals of similar age, sex and ethnicity.⁶ It has also been recognized that high normal fasting blood glucose and increasing HbA1C levels in individuals without DM are risk factors for cardiovascular events and subclinical atherosclerosis.⁷

HbA1c has been considered a standard criterion to monitor and diagnose DM for years.⁸ It has several advantages over fasting plasma glucose and oral glucose tolerance tests, including greater convenience, greater preanalytical stability, and lesser day-to-day perturbations during stress and illness.⁹⁻¹² New clinical practice recommendation from the American Diabetes Association advocates the use of HbA1c in diagnosis of diabetes mellitus largely on the basis of the established association between Glycated hemoglobin and microvascular disease.¹³

Elevated HbA1c is regarded as an independent risk factor for coronary artery disease (CAD) in patients with or without DM, whereas levels of HbA1c < 7% deemed appropriate for reducing risk of vascular complications.¹⁴ The level of HbA1c has been associated with number of significantly diseased vessels.^{15,16} Moreover, it has been found that the prevalence of elevated HbA1c levels in patients undergoing coronary artery bypass grafting is high.¹⁷ Thus, the level of HbA1c may be associated with the severity of coronary artery disease in non-diabetic individuals. The authors of Diabetes Control and Complication Trial showed the possible association between HbA1c levels and chronic diabetic complications, including cardiovascular events in type 1 DM.¹⁸ Though HbA1c level is considered as predictive marker of cardiovascular disease and mortality in patients with diabetes mellitus, however, association of HbA1c with Coronary Artery Disease (CAD) in non-diabetics is inconsistent.^{19,20}

A lot of works has been done to show the linear relationship between HbA1c and ASCVD & death in non-diabetics in past years.²⁰⁻²⁴ Elevated HbA1c level being associated with long-term mortality, but not with early deaths in nondiabetic patients with CAD.²⁵

Increased glucose level may suggest previously undiagnosed DM; however, the glycemic test is

rarely used to diagnose diabetes in patients encountering AMI because the glucose level could increase at the acute phase of cardiac events in all patients. The association between HbA1c and the severity of CAD is still a contentious issue. Yet, few studies have shown that HbA1c is not related to the severity of coronary artery disease (CAD) in non-diabetic patients.^{26,27}

The important clinical significance of NSTEMI is that delay in diagnosis can lead to increased morbidity, risk of arrhythmia and death.²⁸ Gensini suggested a scoring system which allocates a numerical value for the degree of stenosis in a coronary artery and a multiplication factor that depends on which coronary artery is involved and where the stenosis is located in the coronary artery.²⁹ Gensini score 36 points were regarded as cut-off value for CAD severity. Gensini score < 36 points was considered as mild coronary atherosclerosis, while Gensini score \geq 36 points as moderate or severe coronary atherosclerosis.^{30,31}

In present study, we attempted to find whether HbA1c of non-diabetic adult patients presenting with NSTEMI had any association with the severity of CAD. The findings derived from the study would hopefully be helpful for cardiologists as well as diabetologists to put forward new recommendations about the relationship between HbA1c level and severity of NSTEMI CAD in non-diabetic patients in context of Bangladeshi population.

Methods:

This present study was designed as an observational study at Department of Cardiology, Sir Salimullah Medical College & Mitford Hospital, Dhaka. This study was conducted from April 2019 to March 2020. Non-diabetic patients admitted with a history of NSTEMI within last three months and scheduled for coronary angiography (CAG) were the study population. A total number of 64 patients who fulfilled inclusion and exclusion criteria were selected for the study as the sample population. The samples were collected by purposive sampling method. Patients with previous history of Diabetes mellitus or fasting plasma glucose of \geq 126 mg/dl or 7 mmol/L, HbA1c \geq 6.5%, liver insufficiency, renal insufficiency or recent urinary tract infection within last 3

months, congenital or valvular heart disease, malignant diseases, presence of active infection (pneumonia, meningitis, acute viral illness) with other comorbid conditions, coagulopathy, cardiomyopathy, acute Stroke, severe anemia, history of CABG or PCI were excluded from this study.

Informed written consent was taken from each patient before enrollment. Meticulous history was taken and detailed clinical examination was performed. Risk factors profile including smoking, hypertension, dyslipidemia and family history of myocardial infarction were noted. Necessary physical examinations were done including pulse, blood pressure, jugular venous pressure, basal crepitation, auscultation for any cardiac murmur. Some primary investigations were done including serum troponin value, random blood sugar, serum creatinine, serum electrolytes, lipid profile on the day of admission. Resting ECG of all patients was done at a paper speed of 25 mm/s and 10mm standardization at admission using Fukuda ECG machine (Model: FX -2111) Denshi Co Ltd Japan.

Blood was drawn from every patient immediately after admission, from peripheral veins and was collected in a tube containing EDTA (Ethylene Diamine Tetra Acetic acid) who was diagnosed as a case of non-diabetic NSTEMI. Blood sample was then put in an automated liquid chromatography devices (D-10, Bio-Rad) and results of HbA1c is then expressed in DCCT units.

Patients were divided into 2 groups based on admission HbA1c. One group having HbA1c 5.7–6.4% (High-risk group, 36 patients) and another group with HbA1c <5.7% (Low risk group, 28 patients). Trans thoracic echocardiography was routinely done. Coronary angiogram (CAG) was done by conventional method using SHIMADZU BRANSIST ALEXA device using at least two views of the right coronary artery and four views of the left coronary artery.

Angiographic severity of coronary artery disease was assessed by Gensini score and it was calculated by 2 independent experienced interventional cardiologists. The final Gensini score is the sum of the lesion scores.³² Gensini score 36 points were regarded as cut-off value for CAD severity. Gensini score < 36 points was

considered as mild coronary atherosclerosis, while Gensini score ≥ 36 points as moderate or severe coronary atherosclerosis. Then patients with high and low risk HbA1C groups was correlated with severity of CAD to find their association.

Collected data were processed and analyzed using SPSS (Statistical Package for Social Science), version 23.0 available. The level of significance was set at 5% and p-value < 0.05 was considered significant. Word processing was done by the WORD module of Microsoft Office 2016 (Microsoft Corporation, USA). The study protocol was approved by ethical committee of Sir Salimullah Medical College, Dhaka.

Confidentiality regarding all information's and records was maintained strictly and the patients had the right to withdraw him/herself from the study at any time during the study period.

Results:

This observational analytical study aimed at determine the association between HbA1c and severity of coronary artery disease (based on Gensini score) included a total of 64 non-diabetic, NSTEMI patients. Based on the cut-off value of 5.7% of HbA1c, the patients were divided into two groups – one group with HbA1c < 5.7% (Low risk group) and another group with HbA1c 5.7 – 6.4% (high risk group). The outcome variable, severity of coronary artery disease (CAD), assessed by Gensini score, was also divided into two categories – less severe or mild CAD (Gensini score < 36) and moderate to severe CAD (Gensini score ≥ 36). The exposure variable (HbA1c) and all the confounding variables of interest (age, sex, risk factor/comorbidities and so on) were then compared between the two outcome groups to find their association with severity of CAD. Spearman correlation were done to see the nature correlations between HbA1c and Gensini score as well as between HbA1c and LVEF. The findings obtained from data analyses are presented in table and figures.

Distributions of baseline characteristics are illustrated in Table I. The mean age of the patients of high-risk group was considerably higher (55 years) than that in the low-risk group (50.2 years), although the difference did not turn to significant ($p = 0.069$). Sex, BMI, hypertension, smoking habit

Table-I
Baseline characteristics between high and low risk HbA1c groups.

Baseline characteristics	HbA1c (%)		p-value
	5.7-6.4 (High Risk) (n = 36)	< 5.7 (Low Risk) (n = 28)	
Age* (years)	55.0 ± 10.9	50.2 ± 10.3	0.069 ^{ns}
Sex# (male)	28(77.8)	22(78.6)	0.939 ^{ns}
BMI* (kg/m ²)	33.1 ± 7.9	35.9 ± 8.4	0.157 ^{ns}
Hypertension#	26(72.2)	18(64.3)	0.497 ^{ns}
Smoking habit#	24(66.7)	20(71.4)	0.683 ^{ns}
Family history of CAD#	10(27.8)	10(35.7)	0.497 ^{ns}
Serum TC* (mg/dL)	178.7 ± 35.4	190.7 ± 45.5	0.242 ^{ns}
Serum LDL* (mg/dL)	100.2 ± 33.33	101.4 ± 34.5	0.710 ^{ns}
Serum HDL* (mg/dL)	45.2 ± 27.1	41.5 ± 23.8	0.827 ^{ns}
Serum TG* (mg/dL)	159.6 ± 48.7	197.8 ± 82.1	0.673 ^{ns}
Serum creatinine* (mg/dL)	1.01 ± 0.19	1.07 ± 0.14	0.094 ^{ns}

ns= Not significant (p>0.05). #Data were analyzed using Chi-square (χ^2) Test; figures in the parentheses denote corresponding percentage. *Data were analyzed using unpaired t-Test and were presented as mean ± SD.

and family history CAD were almost identically distributed between the two groups (p = 0.939, p = 0.157, p = 0.497, p = 0.683 and p = 0.497 respectively). The distribution of all the lipids (serum TC, LDL cholesterol, HDL cholesterol and TG) were almost similar between the groups (p = 0.242, p = 0.710, p = 0.827, p = 0.673 respectively). The serum mean creatinine was a bit lower in the high-risk group (1.01 mg/dl) than that in the low risk-group (1.07 mg/dl), although the difference did not reach the level of significance (p = 0.947).

Age and sex distribution between the two outcome groups (moderate to severe and mild) were almost identical (p = 0.748 and p = 0.253 respectively). The presence of overweight and obese subjects was much higher in patients with moderate to severe CAD than that in patients with mild CAD (p = 0.127) (Table II).

Hypertensive patients were considerably higher in patients with severe CAD than that in patients with mild CAD (p = 0.135). The mean systolic blood pressure was much higher in the former group (p = 0.057). More than two-thirds of the patients had smoking habit and smokers were almost identically distributed between the two outcome groups (p = 0.683). Half of the patients with severe CAD had family history of CAD as opposed to 16.7% of the patients with mild CAD (p = 0.004) with risk of having severe CAD in patients with

family history of CAD was 5(95% CI = 1.6-15.7) times higher in the former group than that in the latter group (Table III).

The mean glycosylated haemoglobin (HbA1c) was significantly higher in severe NSTEMI (5.9 ± 0.4%) than that found in the mild NSTEMI (5.5 ± 0.6%) (p = 0.002). The lipid profiles (serum total cholesterol, LDL, HDL and serum triglycerides) were almost similarly distributed between severe NSTEMI and mild NSTEMI (p = 0.738, p = 0.973, p = 0.827 and p = 0.673). The mean serum creatinine was a bit higher in the severe NSTEMI group compared to that in the mild NSTEMI (p = 0.094) (Table IV).

Out of 64 patients, 42 (65.6%) had lesions in LAD, 30 (46.8%) in LCX, 20 (31.2%) in RCA and only 6 (12.5%) had lesions in LM (left main).

Analysis of association between HbA1c and severity CAD revealed that Over 55.5% patients with HbA1c in high-risk group (5.7 – 6.4%) had severe CAD as opposed to 28.6% patients with HbA1c in low-Risk group (<5.7%). The individuals with high-risk group of HbA1c was 3.1(95% of CI = 1.1 – 8.9) times more likely to have severe CAD than those with normal level of HbA1c (< 5.7%) (p = 0.031) (Table VI).

Single-vessel disease (SVD) and triple-vessel disease were considerably higher in patients with

Table-II
Association between demographic characteristics and severity of CAD.

Demographic characteristics#	Gensini score		Odds Ratio (95% CI of OR)	p-value
	≥36 (n = 28)	< 36 (n = 36)		
Age (years) > 50	16(57.1)	22(61.1)	0.8(0.3-2.3)	0.748 ^{ns}
Male	20(71.4)	30(83.3)	0.5(0.1-1.6)	0.253 ^{ns}
BMI (kg/m ²) ≥25	24(85.7)	25(69.4)	2.6(0.7-9.4)	0.127 ^{ns}

ns= Not significant. Figures in the parentheses denote corresponding percentage. #Data were analyzed using Chi-square (χ^2) Test.

Table-III
Co-morbidities and risk factors profile between severity of CAD.

Co-morbidities & risk factors profile	Gensini score Odds		Ratio (95% CI of OR)	p-value
	≥36(n = 28)	< 36(n = 36)		
HTN#	22(78.6)	22(61.1)	2.3(0.7-7.2)	0.135 ^{ns}
Smoking habit#	20(71.4)	24(66.7)	1.3 (0.4-37)	0.683 ^{ns}
Family History of CAD#	14(50.0)	6(16.7)	5(1.6-15.7)	0.004 ^s
Systolic BP	142.3±24.8	132.5±15.6	—	0.057 ^{ns}
Diastolic BP	85.0 ± 19.1	83.5 ± 7.6	—	0.699 ^{ns}

s= Significant. ns= Not significant. Figures in the parentheses denote corresponding percentage. *Data were analyzed using unpaired t-Test and were presented as mean ± SD. # Data were analyzed using Chi-square (χ^2) Test.

Table-IV
Association between biochemical variables and Gensini score.

Biochemical investigations*	Gensini score		p-value
	≥36 (n = 28)	< 36 (n = 36)	
HbA1c (%)	5.9 ± 0.4	5.5 ± 0.6	0.002 ^s
Serum TC (mg/dL)	185.9 ± 37.2	182.5 ± 42.9	0.738 ^{ns}
Serum LDL (mg/dL)	101.8 ± 36.4	101.5 ± 31.8	0.973 ^{ns}
Serum HDL (mg/dL)	44.4 ± 22.4	43.0 ± 28.0	0.827 ^{ns}
Serum TG (mg/dL)	172.3 ± 87.9	179.6 ± 47.4	0.673 ^{ns}
Serum creatinine (mg/dL)	1.07 ± 0.18	1.01 ± 0.15	0.094 ^{ns}

s= significant. ns= not significant. Figures in the parentheses denote corresponding percentage. *Data were analyzed using unpaired t-Test and were presented as mean ± SD.

Table-V
Distribution of significant lesions in major coronary arteries (N=64).

Significant Lesion	Frequency	Percentage (%)
LM	06	12.5
LAD	42	65.6
LCX	30	46.8
RCA	20	31.2

Table-VI
Association between HbA1c and severity of CAD (N=64).

Gensini score#	HbA1c (%)		Odds Ratio (95% CI of OR)	p-value
	High Risk (5.7-6.4) n=36	Low Risk (<5.7) n=28		
≥ 36 (n = 28)	20 (55.5)	8 (28.6)	3.1(1.1 -8.9)	0.031 ^s
< 36 (n = 36)	16 (44.4)	20 (71.4)		

s= significant. Figures in the parentheses indicate corresponding %; # Chi-squared Test (χ^2) was done to analyses the data.

higher HbA1c (5.7 – 6.4%) than those with HbA1c < 5.7%. However, the association between HbA1c and number vessels affected was not statistically significant ($p = 0.647$) (Table VII).

Analysis of association between HbA1c and LVEF shows that 80% of the patients with reduced LVEF (< 50%) had HbA1c in high-risk group (5.7 – 6.4%) as compared 45.5% of the patients with preserved EF. The individuals with high-risk group of HbA1c was 4.8(95% of CI = 1.4 – 16.7) times more at risk of having reduced LVEF than those with normal level of HBA1c (< 5.7%) ($p = 0.010$) (Table VIII).

Regional wall-motion abnormality (RWMA) demonstrated their significant presence in

patients with high-risk group of HbA1c ($p = 0.002$). The individuals with high-risk group of HbA1c was at nearly 6(95% of CI = 1.7 – 17.8) times higher risk of developing RWMA than those with normal level of HBA1c (< 5.7%) ($p = 0.002$) (Table VIII).

Correlation between HbA1c and Gensini score shows that the two variables exhibit a linear relationship indicating that Gensini score increases with increase in HbA1c ($r = 0.289$, $p = 0.021$) (Fig. 1)

Correlation between HbA1c and LVEF is shown in Fig. 3. The two variables bear an inverse relationship indicating that LVEF decreases with the increase in HbA1c ($r = - 0.375$, $p = 0.002$) (Fig. 2).

Table-VII
Association between HbA1c and number of vessels affected (N=64).

HbA1c (%) #	Number of vessels affected			p-value
	SVD (n = 26)	DVD (n = 20)	TVD (n = 18)	
5.7 – 6.4	16 (61.5)	10 (55.6)	10 (50.0)	0.647 ^{ns}
< 5.7	10 (38.5)	10 (50.0)	8 (44.4)	

ns= Not significant. Figures in the parentheses denote corresponding percentage. # Data were analyzed using Chi-square (χ^2) Test

Table-VIII
Association between HbA1c and RWMA& LVEF (N=64).

HbA1c (%) #	High Risk (5.7– 6.4)	Low Risk (< 5.7)	Odds Ratio (95% CI of OR)	p-value
LVEF (%)< 50	16(80.0)	4(28.6)	4.8(1.4 -16.7)	0.010 ^s

S= significant. Figures in the parentheses indicate corresponding %; # Chi-squared Test (χ^2) was done to analyses the data.

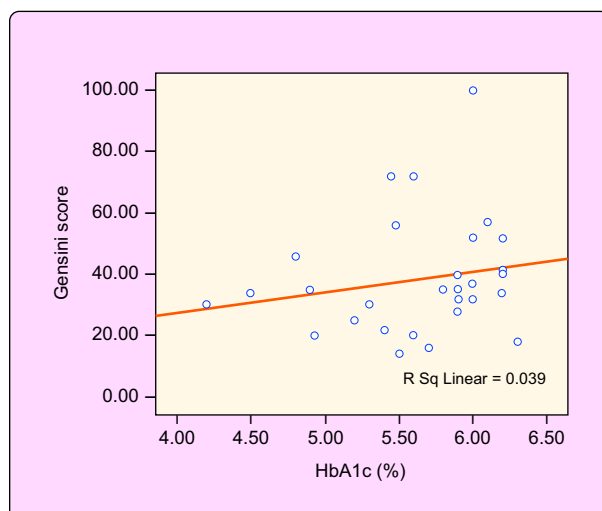


Fig-1: Correlation between HbA1c and Gensini score ($n = 64$)

Discussion:

Cardiovascular diseases are leading causes of mortality and morbidity in industrialized countries, and they are also emerging as prominent public health problem in developing countries like Bangladesh. Control of cardiovascular diseases is, therefore of utmost importance to improve life expectancy and quality of life. Atherosclerosis, chronic inflammation and endothelial dysfunction are major driving forces underlying the initiation of atheromatous plaque formation and their progression to CAD. Endothelial dysfunction due to chronic inflammation in atherosclerosis has been suggested as an association of microvascular or macrovascular complications in myocardial infarction patients and it is considered as an indicator of severity of vascular dysfunction. Acute glycemic disorder, indicated by a high plasma glucose level, is a powerful predictor of prognosis in patients with acute myocardial infarction (AMI) in diabetic patients. However, association of HbA1c with CAD and its severity in non-diabetics is inconsistent. The present study was, therefore, undertaken to find the association between HbA1c and severity CAD in non-diabetic NSTEMI patients.

In the present study, baseline characteristics of risk factors between high risk and low risk groups were almost identically distributed. The mean age of patients in High-risk group and Low risk group

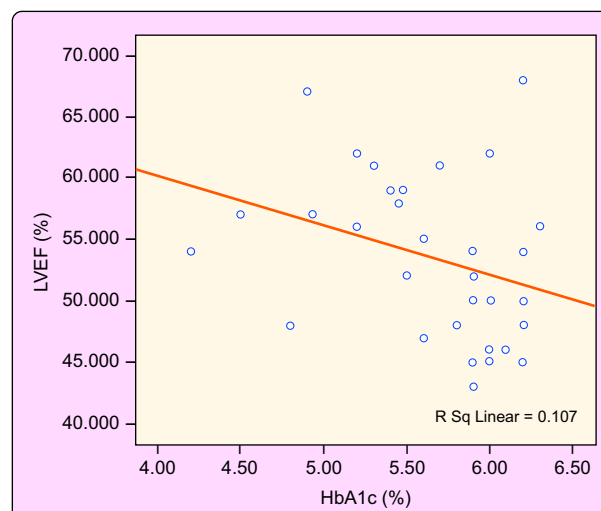


Fig-2: Correlation between HbA1c and LVEF ($n = 64$)

was 55.0 ± 10.9 and 50.2 ± 10.3 years respectively. Similar studies in Bangladesh found mean age of IHD patients to be 50.15 ± 8.8 years which is also similar to this study.^{3,34}

In this study, male patients were more in both high-risk group and low risk group respectively and the difference between the two groups was not significant. The study conducted by other authors in Bangladesh found that male are predominant.³³⁻³⁶ Regarding CAD risk factors in this study, smoking, diabetes mellitus, hypertension, family history of CAD, dyslipidemia, and obesity, did not differ significantly between patients with High risk and Low risk group.

Regarding LVEF, in this study, 80% of the patients with reduced LVEF ($< 50\%$) had HbA1c in high-risk group as compared 45.5% of the patients with preserved EF. The correlation between HbA1c and LVEF bear a negative relationship indicating that LVEF decreases with the increase in HbA1c with 37.5% decrease in LVEF could be explained by increase HbA1c. Regional wall-motion abnormality demonstrated their significant presence in patients with high-risk group of HbA1c. Sahal et al. also found significant difference between two groups regarding LVEF, RWMSI and Gensini score.³⁷

In our study, over 55.5% patients with HbA1c in high-risk group had severe CAD as opposed to 28.6% patients with HbA1c in low-Risk group. The

individuals with high-risk group of HbA1c was 3.1 (95% of CI = 1.1 – 8.9) times more prone to have severe CAD than those with HbA1c < 5.7%. Spearman correlation between HbA1c and Gensini score depicted that the two variables exhibit a linear relationship indicating that Gensini score rises parallel with the rise of HbA1c. Correlation coefficient, $r = 0.289$ indicates that 28.9% of the changes in Gensini score can be explained by HbA1c.

Many literatures have documented an increase in cardiovascular risk with increases in glycated hemoglobin values within the nondiabetic range³⁸⁻⁴⁶

A study conducted on 905 non-diabetic, CAD patients in India by Przemysław et al. showed that in non-diabetic patients, higher HbA1c levels were significantly associated with CAD. Elevated HbA1c was strongly correlated with disease severity and higher SYNTAX score. The study concluded that HbA1c is a surrogate marker for chronic dysglycemia and could be utilized as an independent predictor of CAD and its severity even in non-diabetic subjects.⁴⁷ In our study we estimated the severity of CAD in greater detail by using the Gensini score and it has positive correlation with HbA1c.

Selvin and associates showed that people with a glycated hemoglobin value of 6.0% or higher are at high risk for the development of diabetes, even after adjustment for other risk factors and independently of baseline fasting glucose levels. They also observed that glycated hemoglobin is a marker of cardiovascular risk. In their study of nondiabetic population, glycated hemoglobin remained associated with cardiovascular disease and death even after adjustment for baseline fasting glucose levels; they suggesting that glycated hemoglobin may be superior to fasting glucose for characterizing long-term risk.²¹

Summarizing the findings of the present study and those other studies compared and contrasted hitherto, HbA1c level seems to be a useful marker and has a prognostic implication to predict the severity of CAD among non-diabetic patients. Transthoracic echocardiography for estimation of LVEF and RWMA should be done routinely prior to coronary angiography to predict the severity of

CAD. The measurement of HbA1c is well-standardized, its biologic variability is bare minimum, and does not require overnight fasting to undergo a test. In addition, it is relatively unaffected by acute changes in glucose levels. All these advantages make HbA1c a dependable cardiac marker in risk stratification of non-diabetic patients presenting with CAD.

Limitations:

Although several factors other than HbA1c were found to be associated with severity of CAD in NSTEMI, the small sample size limits the conduction of regression analysis to find the independent predictors of CAD. The study was contemplated with a cross-sectional design. In terms of strength of the observational studies, cohort design is better, although it was not designed so because of time constraint and apprehension of loss to attrition.

Conclusion:

The study concluded that over half of the non-diabetic, NSTEMI patients with high-risk range HbA1c are likely to have severe CAD than those with HbA1c within normal range. The patients with high-risk group of HbA1c carry more than three-fold higher risk of having severe CAD than those with HbA1c lying in the normal range. It can help to identify individuals at high risk for advanced CAD who might need an earlier therapeutic approach and closer clinical follow-up.

Conflict of Interest - None.

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