

Harsukh Educational Charitable Society

International Journal of Community Health and Medical Research

Journal home page: www.ijchmr.com

doi: 10.21276/ijchmr

Official Publication of "Harsukh Educational Charitable Society" [Regd.]

ISSN E: 2457-0117 ISSN P:2581-5040

Index Copernicus value 2016 = 52.13

Original Article

Association Of Glycated Hemoglobin (Hba1c) With Coronary Artery Disease In Non-Diabetic Patients: A Hospital Based Observational Study

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ABSTRACT

Background: The association between HbA1c and cardiovascular risk is inconsistent in non-diabetic subjects. In the present study, we examined the association between HbA1c and presence of angiographically proven coronary artery disease (CAD), its severity and complexity in non-diabetic subjects. **Material & Methods:** A hospital based observational study done on 100 patients in Department of medicine, Government Medical College, Bharatpur, Rajasthan. Severity of CAD was calculated by GENSINI Score. The diagnostic procedure was performed using Seldenger's technique, all images were recorded digitally. **Results:** The present study done on 100 patients, male gender pre dominated (80%). Most of patients were overweight with mean BMI = 27.9±3.6. The most common cause of performing coronary angiography was unstable angina (45%). Seventy patients were in high risk group with (HbA1c 5.7 – 6.4%) while only 30 patients were in low risk group with (HbA1c <5.7%). **Conclusion:** We concluded that HbA1c level is a useful marker and has a prognostic value to predict the severity of CAD among non-diabetic patients.

Keywords: Cardiovascular disease, Diabetes mellitus, Gensini score, HbA1c

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This article may be cited as: Bansal SC, Singh U. Association Of Glycated Hemoglobin (Hba1c) With Coronary Artery Disease In Non-Diabetic Patients: A Hospital Based Observational Study. HECS Int J Comm Health Med Res 2018; 4(3):131-133

INTRODUCTION

Diabetes mellitus (DM) is accounted one of the most dynamic risk factors for cardiovascular diseases (CVD). The overindulgence risk for CVD is 2 to 8 folds higher in patients with diabetes mellitus compared to non-diabetics of similar age, sex and ethnicity¹. A positive correlation has been reported between the duration of diabetes and the risk of developing CAD (coronary artery disease)². Studies of small sample size have shown an association between the metabolic control and duration of diabetes and the severity of coronary artery disease in subjects with diabetes³. HbA1c, which is used for monitoring the levels of plasma glucose level of diabetic patients, now becomes one of the diagnostic criteria for DM. There is a significant association between HbA1c levels and atherosclerosis in a non-diabetic population with CAD and even in HbA1c level in normal reference range. Elevated glycosylated hemoglobin A1c (HbA1c) is associated with increased risk of atherosclerosis and cardiovascular mortality in diabetic patients. The association between HbA1c and cardiovascular risk is inconsistent in non-diabetic subjects. In the present study, we examined the association between HbA1c and presence of angiographically proven coronary artery disease (CAD), its severity and complexity in non-diabetic subjects.

MATERIAL AND METHOEDS

A hospital based observational study done on 100 patients in Department of medicine, Government Medical College, Bharatpur, Rajasthan.

Inclusion criteria:

- All non-diabetic with HbA1c < 6.5%.
- All patients with proven CAD angiographically.

Exclusion criteria:

- Patient with history of diabetes.
- HbA1c > 6.5%.
- Previous history of CAD, CABG or PTCA.
- Patient with less than 18 years of age.
- Co-morbidities like sepsis, hemoglobinopathy or chronic kidney disease were excluded from the study.
- Patient who didn't give their consent.

Severity of CAD was calculated by GENSINI Score.⁴ Gensini score grades narrowing of the lumen of the coronary artery and scores it with numerical values with the following method; score 1

for 1–25% narrowing, 2 for 26–50% narrowing, 4 for 51–75%, 8 for 76–90%, 16 for 91–99%, and 32 for a completely occluded artery. Gensini score was expressed as the sum of the scores for all three coronary arteries to evaluate the entire extent of coronary artery disease.

Coronary angiogram: The diagnostic procedure was performed using Seldenger’s technique, all images were recorded digitally.

Statistical Analysis –Appropriate statistical tests were used to find significant association. P-value <0.05 were considered statistically significant. Appropriate statistical formula was applied.

RESULTS

The present study done on 100 patients, male gender predominated (80%). Most of patients were overweight with mean BMI = 27.9±3.6. The most common cause of performing coronary angiography was unstable angina (45%). The Gensini score ranged from (1 to 168) with a mean of 36.25±22.5. Seventy patients were in high risk group with (HbA1c 5.7 – 6.4%) while only 30 patients were in low risk group with (HbA1c <5.7%). Other data of both groups were comparable and shown in table 1. Gensini score was found to be significantly higher in the high risk group. Using Pearson’s correlation coefficients, the level of HbA1c was strongly correlated with Gensini score (r=0.35, P<0.05).

Table 1: Demographic, clinical, laboratory & echocardiographic data of both groups:

Variables	High risk group (N=70)	Low risk group (N=30)	P- value
Age	53.5±6.3	52.5±9.7	>0.05
Male	58 (82.85%)	24 (80%)	>0.05
Smoking	52 (74.28%)	20 (66.66%)	>0.05
BMI	27.9±3.7	26.7±4.9	>0.05
Unstable angina	27 (38.57%)	19 (63.33%)	<0.05
FBG (mg/dl)	94.7±15.6	91.2±11.7	>0.05
TGs (mg/dl)	146.3±60.3	155.2±61.7	>0.05
LDL (mg/dl)	120.2±27.8	117.9±41.6	>0.05
HDL (mg/dl)	36.4±5.7	36.8±4.9	>0.05
Gensini Score	45.7±27.2	26.8±17.8	<0.05

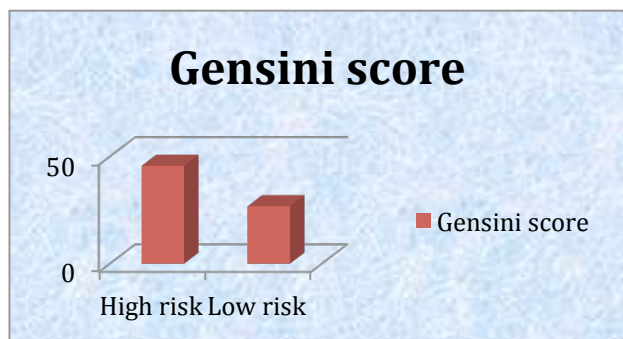


Figure 1: Comparison between high and low risk groups regarding Gensini score.

DISCUSSION

Diabetic patients tend to exhibit other risk factors for CAD, like hypertension and obesity. Patients with diabetes have lipid-rich atherosclerotic plaques, which are more vulnerable to rupture than

the plaques seen in non-diabetic patients.^{5,6} Yoo et al. described an overall increase in atherosclerotic burden and a 3.5-fold higher risk of coronary stenosis that was independent of other cardiovascular risk factors in diabetic patients.⁷ Inflammation plays an important role in atherosclerosis. Elevated HbA1c levels associated with an increased risk for future microvascular & macrovascular disease in diabetics.⁸

Rivera et al studied the association between increasing levels of HbA1c and coronary plaque characteristics in asymptomatic individuals who diagnosed as non diabetics. Unadjusted analysis showed a positive association between increasing levels of HbA1c and the number of coronary segments (p<0.0001). The association persisted even when traditional risk factors were taken into account.⁹

Recently in 2014, Anping et al conducted a study to investigate relationship between HbA1c level and CAD severity in non-diabetic patients. Multivariate regression analyses showed that HbA1c strongly associated with the severity of CAD after adjustment for other traditional risk factors as well as fasting blood glucose.¹⁰

Biomy R et al (2017)¹¹ concluded that Among non-diabetic patients, higher HbA1c is significantly correlated with the severity of CAD. HbA1c level has a prognostic value to predict the severity of CAD among non-diabetic patients. There were different mechanisms might explain the correlation between level of HbA1c and CAD severity even in non diabetics. Increased HbA1c level could reflect more generation of advanced glycosylation end-product, which might subsequently attached to vessel wall causing endothelial dysfunction and oxidative stress promotion.¹² On the other hand, the binding of advanced glycosylation end-product might also result in inflammatory cytokines such as CRP over-production.¹³ Increased CRP level has been found significantly associated with the instability of plaque.¹⁴ Finally, increased advanced glycosylation end-product could interfere with endogenous fibrinolytic system which might result in higher risk of coronary artery stenosis.¹⁵

CONCLUSION

We concluded that HbA1c level is a useful marker and has a prognostic value to predict the severity of CAD among non-diabetic patients. It may be used as a cardiac marker in risk stratification of non-diabetic patients presenting with acute coronary syndrome and indicated for coronary angiography.

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Source of support: Nil

Conflict of interest: None declared

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