IJAM

RESEARCH PAPER

EVALUATION OF SOME VARIABLES ASSOCIATED WITH HBA1C AND INFLUENCING HEART DISEASE

Dr Hafed I Hussein MD), Ramadi Teaching Hospital, Internal Medicine Dept, AL-Anbar Health Directorate, Iraq

ABSTRACT

Objective: To understand variables that are significantly associated with HbA1c and influencing heart disease.
Patients and methods: Two groups of patients; diabetic group (DG) 132 patients, and non-diabetic (NDG) group 84 patients, were considered in this study. Information about some relevant variables that thought to be associated with both HbA1c and heart disease were recorded and subjected to statistical analysis. IBM SPSS version 20 was used to run statistical procedures used in this study.
Results: Statistical analysis showed that the proportions of occurrence for the relevant variables from the two groups of patients were significantly different and that these of the DG are essentially higher than that of the NDG. Patients of the diabetic groups were showed significantly higher proportion of occurrence for the relevant variables for those with HbA1c>7% than those with HbA1c<7%. Age and HbA1c were significantly found to have inverse relationship.
Conclusion: In the cases that patients lose control on HbA1c, it will be gradually deteriorated by time and that interpret the inverse relationship between age and HbA1c. Non-diabetic patients admitted to emergency unit have no clue that they have hyperglycemia which may resulted in a variety of bad prognosis.

KEY WORDS : Diabetes mellitus, HbA1c, Heart disease

INTRODUCTION

Diabetes mellitus (DM) as noted by many researchers considered to be associated vascular disease with complications regarded both microvascular and macrovascular[1-2]. Atherosclerosis is believed to be accelerated by hyperglycemia and that will lead to the formation of glycated proteins that gradually cause endothelial dysfunction[3].
In a study conducted by MacDonald MR,et al, 2008[4] showed that prevalence of diabetes in major heart failure (HF) trials is approximately 20% to 30%, although data from an acute HF registry in the same study suggest that the prevalence may be as high as 45%. These findings without any doubt reflect the importance of considering the association between DM and cardiac states as a point of interest.

Cardiovascular mortality has been found to be twice in diabetic men and four times in diabetic women when compared to their non-diabetic counterparts[5].

HbA1c could be considered a good marker of glycated proteins and HbA1c levels of more than 7% are associated with a significant increase in the risk of cardiac events and deaths[6].

This study aims to find out whether or not HbA1c levels are significantly correlated with severity of cardiac states.

PATIENTS AND METHODS

In this study, all patients admitted to the intensive care unit (ICU) of Al-Ramadi General Teaching Hospital during the period December 2016 to April 2017 were included. In addition to the routine medical investigation, diabetes mellitus tests were done for all patients and accordingly the patients were divided into two main groups. The first groups is the diabetic group(DG) which consists of 132 patients whom previously diagnosed as diabetic patients. The other group was the non-diabetic group (NDG) and consist of 84 patients that their blood sugar <120 mg/dl and their HbA1c less than 7%. Patients whom their diabetes mellitus tests were positive but they were not previously diagnosed as diabetic patients and never been on diabetes mellitus medication were excluded from the study.

The data obtained from patients included in this study were analyzed by the use of the well-known statistical software SPSS (Statistical Program for Social Sciences) version 23. A p value < 0.05 was considered significant wherever used in this study.

RESULTS

The collected data had been arranged in two main tables. Table 1 contained information used to compare variables in the diabetic (DG) and non-diabetic (NDG) groups, whereas table 2 contained information used to compare relevant variables of the DG in which this group has subdivided into two main groups; those with HbA1c below or equals to 7% and those with HbA1c greater than 7%.

With regard to table 1, mean age of patents in the DG is found to be significantly lower than that of the patients in the NDG.

Mean HbA1c in the patients with DG is found to be significantly greater than that of the patients in the NDG. This variable is actually reflect that most of the patients in the DG do not have a good strategy to control their blood glucose and as a result their HbA1c levels.

Previous myocardial infarction occurred significantly in a high rate of patients in the DG than in the patients of the NDG. According to table 1, about third of the patients in the DG had been admitted with a history of previous myocardial infarction. On the other hand about 7% of the patients in the NDG showed a history of previous myocardial infarction.

Angina found to occur in about 35% of the patients in the DG whereas it occurs in less rate (about 21%) in the patients of the NDG. Difference between the two percentages was statistically significant.

Triglyceride greater than 150 mg/dl was found in a significantly higher in a proportion of patients from DG than the corresponding proportion from patients in the NDG. High density lipoprotein less than 45 mg/dl has found to occur in a proportion of patients from DG which is significantly higher than that of the NDG.

Triple vessel disease was accounted for 22.73% of the patients from

Article History	Received	Accepted	Published
	07/04/2018	16/07/2018	20/09/2018

***Corresponding Author** Dr Hafed I Hussein
MD), Ramadi Teaching Hospital, Internal Medicine Dept, AL-Anbar Health Directorate, Iraq
aldulaimihafidh61@gmail.com

DG compared to 9.52% for NDG. Difference between the two percentages was statistically significant as presented in table 1.

Table 1: Comparison between patients from DG and NDG with regard to variables thought to influence cardiac diseases.

Variable	DG		NDG		P-value
	No.	%	No.	%	
Total Number	132	100	84	100	
Mean Age	57.91±2.59		61.81±3.17		0.0001
Mean HbA1c	8.77±1.14		5.46±1.18		0.0001
Previous MI	38	28.79	6	7.14	0.0001
Angina	46	34.85	18	21.43	0.0174
TG>150mg/dl	87	65.91	28	33.33	<0.0001
HDL < 45mg/dl	97	73.48	45	53.57	<0.0013
TVD	30	22.73	8	9.52	<0.01

The group of diabetic patients was divided into two groups; those with HbA1c less than or equal 7% and those with HbA1c greater than 7%. Variables that are listed in table 2 were compared on the basis of this breakdown of patients.

All variables stated in table 2 were accounted for percentages that found to be statistically significantly higher in the group of the patients with HbA1c > 7%. This is actually gave an impression that high level of HbA1c is a very bad indication for potential complications regarding cardiac diseases.

In order to cast light on the relationships between the set of variables involved in table 2, simple statistical investigations were obtained. Figure 1 shows the scatterplot of the LVER versus HbA1c which revealed a little indication that LVER reduced as HbA1c increased. This finding is not supported by statistical proof, rather it is only a visual note that can be concluded from the figure. Moreover, most of the points were scattered around the proposed regression line. This is really another indication for the randomness which may led to a contraindication that the relationship between these two variables tend to be fluctuated around a midpoint of HbA1c.

Table 2: Comparison between variables thought to influence cardiac diseases for DG patients with reference to HbA1c levels.

Variable	HbA1c <7%		HbA1c>7%		P-value
	No.	%	No.	%	
Unstable angina	14	10.61	45	34.09	<0.001
STEMI	4	3.03	21	15.91	<0.001
NSTEMI	3	2.27	10	7.58	0.0287
Heart failure	4	3.03	29	21.97	<0.001
LVEF <50%	13	9.85	71	53.79	<0.001
TVD	2	1.52	28	11.36	<0.001
Systolic dysfunction	11	8.33	57	43.18	<0.001
Diastolic dysfunction	14	10.61	58	43.94	<0.001

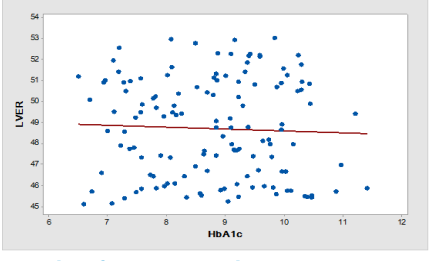

Fig.1: Scatterplot of LVER versus HbA1c.

The simple linear correlation coefficient between age and HbA1c for the DG of patients found be positively significant (r=0.242, p-value=0.005).

Figure 2 shows the scatterplot of the observations from the two variables and the proposed regression line suggests that as age of DG patients increased their corresponding readings of HbA1c increased.

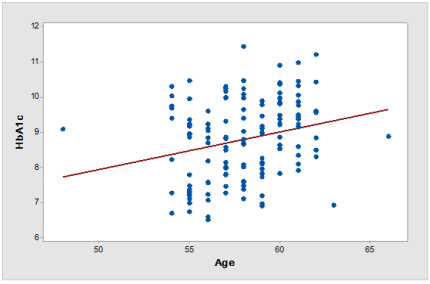

Fig.2: Scatterplot of HbA1c versus age in the DG.

DISCUSSION

Many previous studies concluded that heart disease varies among patients according to the given health status of the patients, reasons of the disease, duration of the disease, and the control strategy implemented to reduce the risk of more deterioration in patients status[7-12].

Patients with Diabetes Mellitus (DM) showed causes and findings from non-diabetic patients. Diabetics believed to develop coronary artery disease (CAD) earlier than non-diabetics[13]. Previous studies showed that prevalence of coronary artery disease (CAD) is higher in patients with DM[14,15].

With regard to the results of table 1, significant differences have been seen in the set of variables contained in the table between DG and NDG of patients. These results are emphasis the previously mentioned fact that diabetic patients are more exposing to the risk factors of heart disease than non-diabetic patients[16]. These findings are found to be in agreement with other studies[17-19].

Non-diabetic patients with HbA1c >7% are actually undiagnosed yet as diabetic patients. This is also indicating that such patients do not pay any attention for their real need to a certain diet regime to avoid the risk of being diabetics and as a result wait the bad prognosis of such a problem.

Hyperglycemia could resulted in stress hyperglycemia which is commonly occurred in patients admitted to the intensive care units with acute coronary syndromes. Stress hyperglycemia is defined as a transient elevation of blood glucose due to the stress of the illness[20]. The blood sugar levels in stress hyperglycemia are usually between 140mg/dl to 300mg/dl, even though it can sometimes go up to 500mg/dl[20]. Hyperglycemia in patients with Acute Myocardial Infarction (AMI) enhances the risk of mortality and morbidity whether or not patient has a prior diagnosis of diabetes[##]. Stress hyperglycemia even in non-diabetics, is associated with many abnormalities usually seen in diabetics, like increased oxidative stress, inflammation and activation of stress responsive kinases[20].

When it comes to the comparisons between the two groups of diabetic patients stated in table 2, a significantly higher proportion of patients in the groups of patients with HbA1c>7% was found for all variables involved in the table. This is in agreement with similar studies conducted about similar variables[21,22].

With respect to the patients in DG, the correlation coefficient between HbA1c and left ventricular ejection rate was not statistically significant, that is, there is no chance that HbA1c negatively influence LVER. Unfortunately, no study confirm or deny this finding to the best of our knowledge.

There is an evidence that age and HbA1c have inverse relationship since they found to be statistically have significant correlation coefficient. This is very logical since HbA1c getting worse by time due to gradual deterioration that will be uncontrolled as time passed on.

CONCLUSION

This study showed that risk factors of heart disease are significantly

occur in diabetic patients in a high proportion than in non-diabetic patients. Moreover, risk factors of heart disease are found to occurred significantly in high proportions of diabetic patients with HbA1c>7% than their counter parts with HbA1c<7%.

HbA1c is found to have an inverse relation with age of patients with diabetes mellitus.

REFERENCES

1. Haffner SM, Stern MP, Hazuda HP et al. Cardiovascular risk factors in confirmed prediabetic individuals. Does the clock for coronary heart disease start ticking before the onset of clinical diabetes. JAMA 1990;263;2893-8.
2. Laakso M. Dyslipidemia, morbidity and mortality in non-insulin dependent diabetes mellitus: lipoprotein and coronary heart disease in Non-insulin Dependent Diabetes Mellitus. J Diabetes Complication1999;11:137-41.
3. Brownlee M. Advanced glycosylation in diabetes and aging. Ann Rev Med 1988;46:223-4.
4. MacDonald MR, Petrie MC, Hawkins NM, et al. Diabetes, left ventricular systolic dysfunction, and chronic heart failure. Eur Heart J 2008;29:1224–40.
5. Garcia MJ, McNamara PM, Gordon T, Kannel WB. Morbidity and mortality in diabetes in the Framingham population. Diabetes 1974;23:105-116.
6. Gerstein HC. Glycosylated Hemoglobin. Finally ready for prime time as a cardiovascular risk factor. Ann Intern Med 2004;141:475-6.
7. CDC, NCHS. Underlying Cause of Death 1999-2013 on CDC WONDER Online Database, released 2015. Data are from the Multiple Cause of Death Files, 1999-2013, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed Feb. 3, 2015.
8. Mozaffarian D, Benjamin EJ, Go AS, et al. Heart disease and stroke statistics—2015 update: a report from the American Heart Association. Circulation. 2015;131:e29-322.
9. Heidenreich PA, Trogdon JG, Khavjou OA, et al. Forecasting the future of cardiovascular disease in the United States: a policy statement from the American Heart Association. Circulation. 2011;123:933-44. Epub 2011 Jan 24.
10. CDC. Deaths, percent of total deaths, and death rates for the 15 leading causes of death in 10-year age groups, by race and sex: United States, 2013.
11. CDC. Disparities in Adult Awareness of Heart Attack Warning Signs and Symptoms—14 States, 2005. MMWR. 2008;57(7):175–179.
12. CDC. State Specific Mortality from Sudden Cardiac Death: United States, 1999. MMWR. 2002;51(6):123–126.
13. Goraya TY, Leibson CL, Palumbo PJ et al. Coronary atherosclerosis in diabetes mellitus. A population based study. J Am Coll Cardiol 2002;40:946-53.
14. Haff ner SM, Lehto S, Ronnemaa T, Pyorala K, Laakso M. Mortality from coronary heart disease in subjects with type 2 diabetes and in non- diabetic subjects with an without prior myocardial infarction. N Engl J Med 1998;339:229-34.
15. Mohan V, Shanthirani CS, Deepa R et al. Urban diff erences in the prevalence of the metabolic syndrome in Southern India. The Chennai Urban Population Study (No.4). Diabet Med 2001;18:280-7.
16. Brezinka V, Padmos I. Coronary heart disease risk factors in women. Eur Heart J 1994;15:1571-84.
17. Claresa L, Meeta S. Case study, The recipe for diabetes success in the hospital. Diabetes Spectrum 2002;15:40-43.
18. Keith A. Website. Stress hyperglycemia and enhanced sensitivity to myocardial infarction. Current Hyeprtension Reports 2008;10:78-84.
19. Umpreizz GE, Isaac SD, Bazargan N et al. Hyperglycemia: An independent marker of in-hospital mortality in patients with undiagnosed diabetes. J Clin Endocrinol Metab 2002;87:978-982.
20. Vinita Elizabeth Manim,, Mary John and Rajneesh Calton. Impact of HbA1c on Acute cardiac states. JAPI • JUNE 2011 • VOL. 59:1-3.
21. Bertoni AG, Hundley WG, Massing MW, et al. Heart failure prevalence, incidence and mortality in the elderly with diabetes. Diabetes Care 2004;27:699-703.
22. Cai L, Li W, Wang G et al. Hyperglycemia induced apoptosis in mouse myocardium: mitochondrial cytochrome C mediated caspase-3 activation pathway. Diabetes 2002;51:1938-48.