ORIGINAL ARTICLE

STUDY OF IMPACT OF GLYCOSYLATED HEMOGLOBIN ON ACUTE CARDIAC STATES

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ABSTRACT

Objectives: To find out the impact of HbA1c levels on the severity and short term complications of patients with heart disease admitted to the Intensive Care Unit (ICU) of Smt. Rasilaben Sevantilal Shah Hospital, Surat.

Methods: 100 patients admitted to ICU with acute cardiac states (STEMI, NSTEMI, UA, DCM, Acute LVF) were prospectively studied. Patients were divided into 2 groups – group A (Diabetics) and group B (Non-Diabetics) and patients were followed up till the time of discharge.

Results: Out of the 100 patients, 58 were Diabetic and 42 were Non Diabetic. The mean HbA1c of Diabetics was 8.9 ± 1.8% and that of Non-Diabetics was 6.03 ± 1.1%. Risk factors like dyslipidemia, hypertension, obesity, previous history of heart disease were found more in Diabetic group than in Non-Diabetic group. History of tobacco chewing, smoking, alcohol, positive family history of heart disease, were more in Non-Diabetic group. Complications like cardiogenic shock, accelerated hypertension, arrhythmias and re-infarction occurred significantly more in patients with patients with HbA1c > 7. Mortality is high in patients with HbA1C>7 (15.5%). STEMI, NSTEMI, UA were seen in a significantly higher proportion of patients with poor glycemic control (HbA1c > 7%) compared to patients with HbA1c level < 7%. In Non-Diabetics 39/42 (92.7%) Patients had HbA1c levels > 5%, 61.8% of whom had HbA1c levels of >5.6%.

Conclusion: Severity and complications of heart disease were significantly higher in diabetics and showed a significant correlation with HbA1c. A large number of nondiabetics presenting with acute cardiac states i.e. 92.7%, had HbA1c values > 5%.

Key words: Diabetes, Cardiovascular disease, HbA1c

INTRODUCTION

Diabetes is considered a highly 'vascular disease' with both micro vascular and macro vascular complications. Macro vascular complications start taking place long before the patient has overt diabetes. Hyperglycemia is an independent risk factor for cardiovascular disease. Hyperglycemia accelerates the process of atherosclerosis by the formation of glycated proteins and advanced glycation end products, which act by increasing the endothelial dysfunction. HbA1c could be considered a good marker of glycated proteins and its assay has been used as a measure of glycemic control in several landmark trials. The Framingham study has shown that the cardiovascular mortality is twice in Diabetic men and four times in Diabetic women when compared to their Non Diabetic counterparts. HbA1c levels of more than 7% are associated with a significant increase in the risk of cardiac events and deaths. Interestingly, this correlation between higher HbA1c levels and increased cardiovascular morbidity occurs even before the diagnosis of clinical diabetes. The present study was undertaken to find out the correlation between HbA1c levels and the severity and complications of patients admitted with acute cardiac states to the Intensive Care Unit of Smt. Rasilaben Sevantilal Shah Venus Hospital, Surat, Gujarat.

Objective: Objective of this study was to find out impact of HbA1c levels on severity and short term complications of patients with acute cardiac states.

METHODOLOGY

Study population: 100 patients admitted to intensive care unit of Smt. Rasilaben Sevantilal Shah Hospital, Surat with Acute Cardiac States during January 2013 to December 2013 (after taking informed consent)

Inclusion criteria: Patients with acute cardiac states includes ST elevation MI (STEMI), Non ST Elevation MI (NSTEMI), unstable angina (UA), Dilated

Cardiomyopathy (DCM) and acute left ventricular failure (LVF). In patients without prior history of diabetes, a diagnosis is made, if they had fasting blood sugar >126 mg/dl or random blood sugar >200 mg/dl on two or more determinations along with an HbA1c of 7% or more. Those patients who required diet controls or insulin while in the hospital for control of blood sugar value were also included in the Diabetic group even when the HbA1c was <7%

Exclusion criteria: Patients with sepsis, heamoglobinopathy and hyperthyroidism were excluded from the study. Patients in whom HbA1c levels could not be obtained were also excluded from the study.

All cases of acute cardiac states with HbA1c measurement were interviewed by using pre-test questionnaire for information collection. Data was entered in Microsoft XL and analyzed as well as tabulated.

RESULTS

Total of 100 cases of acute cardiac emergencies (STEMI, NSTEMI, UA, LVF) admitted in ICU of Smt. Rasilaben Sevantilal Shah Venus Hospital, Surat from January 2013 to December 2013 were included in the study. In our study maximum patients were (22%) observed in age group of 45-49 with male dominancy (69%). Our study shows that males were more seen with acute cardiac emergency than female. In both the age groups acute LVF was the most common cardiac emergency (39%) followed by unstable angina (20%), NSTEMI (17%), STEMI (14%) and DCM (10%).

In our study patients of Acute Coronary Syndrome (STEMI, NSTEMI, and UA) were more observed in diabetic group than non-diabetic group. In diabetic group patients with STEMI were 15%, NSTEMI were 18.9%, UA were 24.1% while in nondiabetics patients with STEMI was 14.2%, NSTEMI was 11.9%, and UA was 14.2%, while patients with DCM and LVF were higher in non-diabetic group. In nondiabetics patients with DCM was 11.9% and LVF was 47% while in diabetics patients with DCM was 8.6% and LVF was 32.7%

In our study chest pain was the most common complaint (62%) followed by breathlessness (51%) and pedal edema (40%), palpitation (15%) and syncope (3%). In Diabetic group breathlessness (51.7%), pedal edema (44.8%), syncope (5.17%) were seen more than in the non-diabetic group. In non-diabetic group chest pain (69%), palpitations (19%) were higher than in the diabetic group. None of the patients with non-diabetics had complaint of syncope. In our study hypertension (72.4%), hyperlipidemia (65.5%), obesity (46.5%) were the most common risk

factors observed in the diabetic group. Risk factors like tobacco chewing (19%), smoking (33.3), alcohol (9.5%), were more observed in non-diabetic group. In our study past history of IHD (56.8%), past history of PVD (3.4%) were more in diabetic group and past history of stroke (11.9%) and positive family history of IHD (16.6) were more in non-diabetic group. No history of PVD was found in non-diabetic group.

Table 1: Distribution of Cardiac emergencies among diabetic and non-diabetic Patients

Cardiac Emergencies	Diabetics (%) n=58	Non Diabetics (%) n=42	Total
STEMI	9(15)	6(14.2)	15
NSTEMI	11(18.9)	5(11.9)	16
UA	14(24.1)	6(14.2)	20
DCM	5(8.6)	5(11.9)	10
ALVF	19(32.7)	20(47)	39

Table 2: Distribution of symptoms among diabetic and non-diabetic patients Symptoms

Symptoms	Diabetics (%) n=58	Non Diabetics (%) n=42(%)	Total
Chest pain	33(56.8)	29(69)	62
Breathlessness	30(51.7)	21(50)	51
Palpitations	7(12)	8(19)	15
Pedal edema	26(44.8)	14(33.3)	40
Syncope	3(5.17)	0(0)	3

Table 3 -Distribution of HbA1c level in diabetics and non-diabetics

HbA1c in Diabetics	No. (%) n=58	HbA1c in Non Diabetics	No. (%) n=42
<7	13(22.4)	<5	3(7.1)
7-8.9	19(32.7)	5-5.5	13(30.9)
9-10.9	17(29.3)	5.6-6	12(28.5)
>11	9(15.5)	>6	14(33.3)

In our study among the diabetic group HbA1c was in highest number of patients in between 7 to 8.9 (32.7%) followed by HbA1c of 9 to 10.9 (29.3%) followed by HbA1c<7(22.4%) and HbA1c>11(15.5%). In non-diabetic group, maximum patients (33.3%) were observed having HbA1c >6 followed by HbA1c of 5 to 5.5(30.9%) followed by HbA1c of 5.6 to 6(28.5%) and HbA1c<5 (7.1%).

In our study patients with STEMI (17.7%), NSTEMI (17.7%), UA (24.4%) more observed in patients with HbA1c>7 while DCM (12.7%) and acute LVF (43.6%) was more observed in patients with HbA1c<7. In our study mortality was higher in patients with HbA1c>7 (15.5%) as compared to patients with HbA1c<7 (5.4%).

DISCUSSION

India leads the world with the largest number of diabetic subjects earning the dubious distinction of being termed the "diabetes capital of the world". [1] According to the Diabetes Atlas 2006 published by the International Diabetes Federation, the number of people with diabetes in India currently is around 40.9 million and is expected to rise to 69.9 million by 2025 unless urgent preventive steps are taken.[2] Heart disease in patients with Diabetes Mellitus (DM) is different from that in Non-Diabetics. Diabetics develop coronary artery disease (CAD) earlier, and have more extensive atherosclerosis. Several previous studies have shown that the prevalence of coronary artery disease (CAD) is higher in patients with diabetes. In our study Male preponderence was noted. In our study 69% of the patients were male and 31% were female (M:F = 2.2:1). In Liu et al study 67.7% were male and 32.3% were female (M:F = 2.09:1).[3] In Abbas Ali Mansour et al study 61.6% were male and 38.4% were female (M:F = 1.6:1).[4] This is well explained by cardio protective action of estrogen and high prevalence of addiction like smoking and alcohol in male. Mean age in diabetic patients was 53.36±10.67 and in non diabetic it was 52±10.24. In Abbas Ali Mansour et al study141 mean age in diabetic patients is 63±14.6 and in nondiabetic it is 61.1±11.3

In this study symptoms among diabetic group like breathlessness (51.7% vs 50%), pedal edema (44.8% vs 33.3%) and syncope (5.17%) were more seen as compared to non-diabetics. In Vinita et al studyalso in diabetics breathlessness (44.6% vs 18.6%), pedal edema (21.7% vs 3.7%) and syncope (4.34%) were more frequently seen as compared to non-diabetic.[5]

In this study in non-diabetic group, chest pain (69% vs 56.8%), palpitations (19% vs 12%) were more seen as compared to diabetic people, In Vinita et al study in nondiabetic group chest pain (75.7% vs 52.2%), palpitations (21.6% vs 10.8%) were more frequently seen.

The present study results show significant divergences in the risk factors between diabetics and non-diabetics. A significantly higher proportion of diabetics had additional cardiovascular risk factors like hypertension (72.4% vs 54.7%), hyperlipidemia (65.5% vs 28.5%) and obesity (46.5% vs 7.1%) when compared with non-diabetics. In Vinita et al study130 in diabetic patients had higher cardiovascular risk factors like hypertension (68.5% vs 50.5%), hyperlipidemia (43.5% vs 20%) and obesity (34.7% vs 6.7%). In Brezinkaet et al also demonstrated that diabetic people was having higher risk factors like hypertension, hyperlipidemia, and obesity.[6] Lu WQ et al also demonstrated higher proportion of hypertension, obesity and dyslipidemia among diabetic people.[7] In non-diabetics history of smoking was seen in 33% while in diabetics it was 12%. In Abbas Ali Mansour et al study in non-diabetics history of smoking was seen in 34.6% while in diabetics it was 32.3%. So from our study it can be well explained that diabetic people are more prone to develop cardiovascular morbidity and mortality due to the associated risk factors like hypertension, obesity, dyslipidemia.

In this study, HbA1c >6 was seen in 33% of non-diabetic patients which is similar to Vinita Elizabeth Mani et al study, HbA1c >6 was seen in 35% patients indicating a large number of subjects with pre-diabetes in this group. Mean HbA1c in non-diabetic group was 6.03 ± 1.19 which is higher than that of mean HbA1c levels of normal population. It is well known that the macro vascular complications start taking place at lower blood sugar levels than the diagnostic cut of values for diabetics which is proven by our study. Dilley et al study conducted in Asian Indians with normal glucose tolerance (NGT), found a strong correlation of HbA1c and cardiovascular risk factors.[8] NGT (normal glucose tolerance) subjects with three or more metabolic abnormalities had the highest HbA1c levels and an HbA1c cut of point of 5.6% was found to have the highest accuracy in predicting both metabolic syndrome and coronary artery disease.

In this study in non-diabetic patients, mortality was 7.2% while in diabetic patients, mortality was 12.7%. In Vinita et al study mortality in non-diabetic was 5.4% while in diabetics it was 8.7%. Overall, in both the studies, mortality was higher in the diabetic group.

In patients with HbA1c>7 mortality was 15.4% and in HbA1c<7 it was 5.4%. In Abbas Ali Mansour et al study mortality in patients with HbA1c>7 was 7.6% while in patients with HbA1c<7 was 3.8%. Overall from both the studies it is apparent that mortality is higher in patients with poor glycemic control. Khawet et al found a continuous and significant relationship between HbA1c, cardiovascular events and allcause mortality, whereby persons with HbA1c < 5% had the lowest rates of cardiovascular disease and mortality.[9] They found a one-percentage point increase in the HbA1c to be associated with a relative increase in risk of death of 1.24 in men and 1.28 in women. Selvinet al found no risk of CAD in patients with HbA1c < 4.6%. However for every 1% increase in HbA1c over 4.6%, there was a 2.5 times increased risk of cardiovascular disease.[10]

CONCLUSION

Severity and complications of heart disease were significantly higher in diabetics and showed a significant correlation with HbA1c. A large number of nondiabetics presenting with acute cardiac states i.e. 92.7%, had HbA1c values > 5%. Acute cardiac emergencies

are more severe and have worse outcomes in diabetic patients.The severity of complications has significant correlation with glycosylated hemoglobin levels. A large number of non diabetic patients had higher glycosylated hemoglobin levels than general population, thus establishing a correlation between acute cardiac emergencies and glycosylated hemoglobin levels even in non-diabetic patients.

There are many patients in our society who are suffering from diabetes mellitus but are undiagnosed. Many of them are diagnosed to have diabetes at the time of acute cardiac emergency. Earlier diagnosis and treatment of diabetes mellitus could have prevented these emergencies. Hence regular screening for diabetes mellitus should be carried out in the general population especially in people above the age of forty having family history of diabetes mellitus. Patients with diabetes mellitus having higher glycosylated hemoglobin levels have higher incidence of acute coronary syndromes and have worse outcomes. Tight control of diabetes mellitus helps in prevention of the acute cardiac complications in diabetic patients Hence all the patients with diabetes mellitus should aim to have excellent diabetic control with exercise, diet and drugs. The aim should be to keep HbA1C at least below 7. As per the American Diabetic Association guidelines, in younger patients, one should aim at glycosylated hemoglobin levels below 6.5.

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