Available online at http://www.ijims.com
ISSN: 2348 – 0343

Impact of Hyperglycaemia on Myocardial Infarction

*[1]Santosh Gosavi, [2]Kapil Raut

[1] Additional Professor, [3] Ex. Resident, Dept. of Medicine, T.N.M.C & B.Y.L.Nair Ch. Hospital, Mumbai

*Corresponding author: Santosh Gosavi

Abstract

Hyperglycaemia is encountered in up to 50% of all ST elevation myocardial infarcted (STEMI) patients, whereas previously diagnosed DM is present in only 20% to 25% of STEMI patients.Present study was undertaken to find out the correlation between hyperglycaemia and complications and outcome in patients admitted with acute myocardial infarction in our hospital. Present prospective observational study was conducted on 200 patients admitted to the medical wards in hospital with acute myocardial infarction with or without diabetes mellitus. After a detailed history and physical examination, blood sugar levels,lipid profile, cardiac enzymes,ECG and echocardiogram were performed in all patients. Patients were then divided into 3 group's i.e. Diabetics, Stress induced hyperglycaemics and non-hyperglycaemics for comparison.Data was analysed using SPSS software ver. 21 usingappropriate statistical tests. Hyperglycemia was observed in 82% of the study subjects, of which 65% were known cases of diabetes, 17% were having stress induced hyperglycemia and 18% were normoglycemics. All the 3 groups were comparable with respect to risk factors like hypertension and dyslipidaemia and complications like cardiogenic shock and heart failure. Poor outcome (i.e. death) was observed in 11.5%, 11.8% and 2.8% of patients with diabetes stress induced hyperglycaemia and non-hyperglycaemics respectively (p> 0.05),but the difference was non-significant. Complaint of angina was found to be significantly lower in diabetics (48.5% vs 67.6% vs 69.4%; p -0.024). Though not significant, but poor outcome was observed with hyperglycaemia irrespective of the diabetic status. We recommend that more studies with larger sample size should be conducted to throw more light on this issue.

Key words: Acute Myocardial Infraction, Angina, Diabetes,Hyperglycemia

Introduction

Cardiovascular disease (CVD) is the leading cause of morbidity and mortality in individuals with diabetes, for which 65% of deaths are attributable to heart disease or stroke. Hyperglycaemia is encountered in up to 50% of all ST elevation myocardial infarcted (STEMI) patients, whereas previously diagnosed DM is present in only 20% to 25% of STEMI patients [1].When admission glucose level exceeds 200 mg/dL, mortality is similar in non-DM and DM subjects with MI. Admission glucose has been identified as a major independent predictor of both in-hospital congestive heart failure and mortality in STEMI [2].Hyperglycaemia accelerates the process of atherosclerosis by the formation of glycated proteins and products,which act by increasing the endothelial dysfunction leading to macrovascular complications [2]. In acute coronary syndromes, glucose metabolism is modified, and stress hyperglycaemia commonly occurssecondary to increased catecholamine levels [3].

Present study was undertaken to find out the correlation between hyperglycaemia and complications and outcome in patients admitted with acute myocardial infarction in our hospital.

Materials and Methods

Present prospective observational study was conducted on 200 Patients admitted during the period of 1st January 2014 to 31st December 2014. Patients admitted to the medical wards in hospital with acute myocardial infarction with or without diabetes mellitus were included in the study.

Inclusion Criteria

Patients with Acute Myocardial Infarction includes Acute myocardial infarction (AMI) both ST elevation (STEMI) and non ST elevation (NSTEMI).

Exclusion Criteria

1. Patient‘s refusal to participate
2. Patient with sepsis, haemoglobinopathy or hypothyroidism.
3. Those with sub-acute or chronic MI (longer than 48 hours between first symptom and admission)

Methodology

After a detailed history and physical examination,lipid profile, cardiac enzymes,ECG and echocardiogram were performed in all patients. Blood was collected by co- investigator in vaccutainors (1 ml in EDTA bulb for CBC, 1 ml in fluoride bulb for blood sugar levels and 3 ml each for LFT/RFT/ Sr. lipids and sent to central laboratory by morning/afternoon trolley that comes for collections. The patients were then divided into 3 group’s i.e. Diabetes, Stress induced hyperglycaemics and non-hyperglycaemics for comparison. Patients were labelled as diabetics based on the past history (diagnosed by a designated medical practitioner); stress induced hyperglycaemic, if they have fasting blood sugar (FBS) >126mg/dl or random blood sugar (RBS) >200 mg/dl and; non-hyperglycaemics, if they don’t fall in any of the category. The treatment was given as per treatment protocol. Patients were followed up till discharge/death and all complications like arrhythmias, cardiac failure and cardiogenic shock were noted.

Statistical Analysis

After data collection, the analysis was done by SPSS software ver. 21 usingappropriate statistical tests. p value of less than 0.05 was taken as level of significance

Results

Hyperglycaemia was observed in 82% of the study subjects, of which 65% were known cases of diabetes, 17% were having stress induced hyperglycaemia and 18% were normoglycaemics. On comparing various parameters among these 3 groups, we observed that all the groups were comparable with respect to risk factors like hypertension and dyslipidaemia and complications like cardiogenic shock and heart failure. Poor outcome (i.e. death) was observed in 11.5%, 11.8% and 2.8% of patients with diabetes,stress induced hyperglycaemia and non-hyperglycaemics respectively,but the difference was non-significant (p> 0.05). Complaint of angina was found to be significantly lower in diabetics (48.5% vs 67.6% vs 69.4%; p -0.024).

Discussion

Major advances in cardiovascular disease, and specifically the treatment of acute coronary syndrome (ACS), have had a significant impact on the morbidity and mortality of patients with acute myocardial infarctions (AMI). Despite these advances, diabetes continues to put patients with and without a prior history of myocardial infarction at significant cardiovascular risk [4].In our study, we found that gender, hypertension, dyslipidaemia, cardiogenic shock and heart failure were comparable between hyperglycaemics and normoglycaemics. Angina is significantly higher in the non-diabetic and stress induced hyperglycemia patients. Pain response to ischaemia is often blunted in diabetics. When diabetics and non-diabetics without evidence of CAD are screened for

ischaemia, there is a higher incidence of silent ischaemia in the former, 6.4–22% and 2.5–11%, respectively [5-9]. Janand-Delenne et al. [10] designed a study to estimate the prevalence of silent myocardial ischaemia and define a high-risk diabetic population by systematically testing diabetic patients without evidence or symptoms of CAD. Silent ischaemia occurred in 21% of them. Acute phase hyperglycaemia and diabetes are both associated with adverse outcomes in acute myocardial infarction, with higher reported incidences of congestive heart failure, cardiogenic shock, and death. However, the association between hyperglycaemia and adverse outcomes is not confined to patients with diabetes. The mechanism is not clear, but it is commonly regarded as a response to stress resulting from catecholamine induced glycogenolysis. Hyperglycaemia, therefore, is seen as an epiphenomenon that is associated with poor outcomes only because adrenergic stress is closely related to the extent of myocardial injury.In present study poor outcome (i.e. death) was observed in 11.5%, 11.8% and 2.8% of patients with diabetes, stress induced hyperglycaemia and non-hyperglycaemics respectively, but the difference was non-significant ($p > 0.05$).Acute hyperglycaemia is associated with multiple biological effects that contribute to a poor outcome of the acute coronary syndromes (ACS) [11]. Admission hyperglycemia is associated with long-term risk for ACS mortality [12],but this association is not homogeneous in different ACS presentations [13], unstable angina, NSTEMI, or STEMI. Besides, mortality up to 1 year can be predicted both by admission glucose and fasting blood glucose, but the better predictor of mortality for longer periods is fasting glucose [14].Elevation of blood glucose on admission is a common feature during the early phase after acute myocardial infarction, even in the absence of a history of diabetes mellitus [15]. However the optimal plasma glucose level may be different between diabetic and nondiabetic patients. Many studies have shown that an elevated plasma glucose level on admission is a major independent predictor of in-hospital and long-term outcome in patients with acute myocardial infarction, regardless of diabetes status [16,17].Capes SE et al. did a systematic review and meta-analysis to assess the risk of in-hospital mortality or congestive heart failure after myocardial infarction in patients with and without diabetes who had stress hyperglycemia on admission. Concluding that acute hyperglycemia with myocardial infarction is associated with an increased risk of in-hospital mortality in patients with and without diabetes; the risk of congestive heart failure or cardiogenic shock is also increased in patients without diabetes [17].

Conclusion

Diabetic patients have lower awareness of pain and have been known to be associated with silent anginas. This phenomenon has also been seen in our study with lower incidence of angina in diabetics. Though not significant, but poor outcome was observed with hyperglycaemia irrespective of the diabetic status. We recommend that more studies with larger sample size should be conducted to throw more light on this issue.

References

1. Wahab NN, Cowden EA, Pearce NJ, Gardner MJ, Merry H, Cox JL. Is blood glucose an independent predictor of mortality in acute myocardial infarction in the thrombolytic era? J Am Coll Cardiol. 2002; 40:1748 –1754.
2. Zeller M, Steg P, Ravisy J, Laurent Y, Janin- Manificat L, L'Huillier I, Beer J, Oudot A, Rioufol G, Makki H, Farnier M, Rochette L, Verges, Cottin Y. Prevalence and impact of metabolic syndrome on hospital outcomes in acute myocardial nfarction. Arch Intern Med. 2005;165:1192–1198.
3. Husband DJ, Alberti KG, Julian DG. ―Stress‖ hyperglycaemia during acute myocardial infarction: An indicator of pre-existing diabetes? Lancet 1983;2:179-81.
4. Haffner SM, Lehto S, Rönnemaa T, Pyörälä K, Laakso M. Mortality from coronary heart disease in subjects with type 2 diabetes and in nondiabetic subjects with and without prior myocardial infarction.N Engl J Med, 1998. 339(4): p. 229-34.
5. Langer A, Freeman R, Josse RG et al. Detection of silent myocardial ischaemia in diabetes mellitus. Am J Cardiol 1991;67: 1037–8.

6. Koistinen MJ. Prevalence of asymptomatic myocardial ischaemia in diabetic subjects. BMJ 1990;301:92–5.
7. Fleg JL. Prevalence and prognostic significance of exercise-induced silent myocardial ischaemia in apparently healthy subjects. Am J Cardiol 1992;69:14B–8B.
8. Pfisterer M, Burckhardt D, Burkart F. Stumme Myokardischaemie. Schweiz Rundschau Med Prax 1988;77:680–4.
9. MiSAD Group. Prevalence of unrecognised silent myocardial ischaemia and its association with atherosclerotic risk factors in noninsulin-dependent diabetes mellitus. Am J Cardiol 1997; 79:134–9.
10. Janand-Delenne B, Bory M, Savin B. Silent myocardial ischaemia in patients with diabetes. Diabetes Care 1999;22: 1396–400.
11. Zarich SW, Nesto RW. Implications and Treatment of Acute Hyperglycemia in the Setting of Acute Myocardial Infarction. Circulation. 2007 May 8;115(18):e436-9.
12. Dirkali A, van der Ploeg T. The impact of admission plasma glucose on long-term mortality after STEMI and NSTEMI myocardial infarction. Int J Cardiology 2007; 121(2):215–217
13. S. Hoshida, M. Teragaki, Y. J. Lim et al. Admission with metabolic disorder is a useful predictor of the 1-year prognosis for patients with unstable angina, but not for patients with acute myocardial infarction: East-Osaka Acute Coronary Syndrome Registry. Coronary Art Dis 2011; 22(6): 416–420
14. Cid-Alvarez B, Gude F, Cadarso-Suarez C et al. Admission and fasting plasma glucose for estimating risk of death of diabetic and nondiabetic patients with acute coronary syndrome: nonlinearity of hazard ratios and time-dependent comparison," Am Heart J,2009;158(6) 989–997.
15. Oswald GA, Corcoran S, Yudkin JS. Prevalence and risk of hyperglycemia and undiagnosed diabetes in patients with acute myocardial infarction. Lancet 1984; 1: 1264 – 1267.
16. Capes SE, Hunt D, Malmberg K, Gerstein HC. Stress hyperglycemia and increased risk after myocardial infarction in patients without diabetes: A systematic overview. Lancet 2000; 355: 773 – 778.
17. Ishihara M. Acute hyperglycemia in patients with acute myocardial infarction. Circ J. 2012 Feb 24;76(3):563-71.

TABLES

Table 1. Comparison of various parameters amonghyperglycaemics and non-hyperglycaemics

Variables	Hyperglycaemia (excluding k/c/o DM)		p- value
	Yes (n-34)	No (n-36)	
Males	23 67.6%	24 66.7%	**1.00**
Smoking	4 11.8%	12 33.3%	**0.04**
Alcohol	13 38.2%	18 50.0%	**0.34**
Hypertension	13 38.2%	16 44.4%	**0.63**
Dyslipidaemia	7 20.6%	10 27.8%	**0.58**
Angina	23 67.6%	25 69.4%	**1.00**
Cardiogenic Shock	3 8.8%	2 5.6%	**1.00**
Heart Failure	6 17.6%	9 25.0%	**0.56**

Table 2. Comparison of outcome among hyperglycaemics and non-hyperglycaemics

Outcome	Hyperglycaemia (excluding k/c/o DM)	
	Yes (n-34)	No (n-36)
Discharge	30	35
	88.2%	97.2%
Death	4	1
	11.8%	2.8%
p- value - 0.19		

Table 3. Comparison of various parameters among Diabetics/ hyperglycaemics and non-hyperglycaemics

Variables	Diabetes/ Hyperglycaemia		p- value
	Yes (n-164)	No (n-36)	
Males	93	24	0.35
	56.7%	66.7%	
Smoking	29	12	0.042
	17.7%	33.3%	
Alcohol	51	18	0.035
	31.1%	50.0%	
Hypertension	94	16	0.19
	57.3%	44.4%	
Dyslipidaemia	60	10	0.34
	36.6%	27.8%	
Angina	86	25	0.06
	52.4%	69.4%	
Cardiogenic Shock	21	2	0.38
	12.8%	5.6%	
Heart Failure	53	9	0.43
	32.3%	25.0%	

Table 4. Comparison of outcome among Diabetics/ hyperglycaemics and non-hyperglycaemics

Outcome	Diabetes/ Hyperglycaemia	
	Yes (n-164)	No (n-36)
Discharge	145	35
	88.4%	97.2%
Death	19	1
	11.6%	2.8%
p- value - 0.134		