ORIGINAL RESEARCH PAPER

Volume-9 | Issue-4 | April-2020 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

TO DETERMINE WHETHER ADMISSION BLOOD GLUCOSE AFFECTS IN-HOSPITAL MORTALITY IN NON-DIABETIC ACUTE MYOCARDIAL INFARCTION PATIENTS AT A TERTIARY CARE HOSPITAL OF NORTH INDIA

General Medicine

Dr Avtar Singh Dhanju Associate Professor, Department of Medicine, G.M.C. Amritsar.

Dr Pulkit Sondhi Junior Resident, Department of Medicine, G.M.C. Amritsar.

Dr Ajay Chhabra* Associate Professor, Department of Medicine, G.M.C. Amritsar. *Corresponding Author

Dr Jaswant Singh Associate Professor, Department of Medicine, G.M.C. Amritsar.

ABSTRACT

INTRODUCTION: Coronary artery disease (CAD) will be the leading cause of mortality by 2020. During recent years, many studies are directed towards the evidence that the concomitant occurrence of hyperglycemia in patients with an acute myocardial infarction (MI) enhances the risk of mortality and morbidity, with or without diabetes.

AIMS AND OBJECTIVES: To determine the relationship of admission blood glucose levels and in hospital mortality in non-diabetic myocardial infarction patients.

MATERIALS AND METHOD: A study of 100 non-diabetic acute myocardial infarction patients was carried out in the Medicine department, Guru Nanak Dev Hospital attached to Government Medical College, Amritsar. Patients were divided among four groups according to admission blood sugar level. Group I (≤120 mg %), Group II (120-139 mg %), Group III (140-179 mg %) and Group IV (>180 mg %). All cases were examined and investigated and followed up for any complication like cardiogenic shock or death during their hospitalization period. Data derived was analyzed using appropriate statistical methods across the groups.

CONCLUSION: It was concluded from the study that even in non-diabetic patients, hyperglycaemia on admission is independently associated with a higher risk of in-hospital mortality.

KEYWORDS

Acute Myocardial Infarction, Diabetes Mellitus, Hyperglycemia

INTRODUCTION:

Coronary artery disease (CAD) is characterized by the partial or complete obstruction of single or multiple coronary arteries leading to a mismatch between myocardial oxygen demand and supply. It is the commonest form of cardiac disease and the leading cause of morbidity and mortality throughout the world. It is being projected as the leading cause of mortality in India and the rest of the world by 2020.[1-3]

The morbidity and mortality of a diabetic patient suffering an acute myocardial infarction (AMI) is more than that of a non-diabetic patients.[4] Elevated glucose levels on admission in non-diabetic patients with AMI are independently associated with large infarct size and a higher mortality rate when compared with patients with normal glucose levels.[5,6]

It has been observed that elevated blood glucose levels adversely affect several mechanisms, including induction of oxidative stress, endothelial dysfunction and impaired fibrinolysis and hypercoagulability. Thus, the detrimental effect of stress hyperglycemia in AMI may also arise from its tendency to enhance inflammation.[7-9]

Based on conflicting literature and because of lack of similar studies conducted in the region, this study aims at exploring the association between the admission glycemic status and in-hospital mortality in acute myocardial infarction in non-diabetic patients.

MATERIAL AND METHODS:

The present prospective study was conducted in the medicine department, Guru Nanak Dev Hospital attached to Government Medical College, Amritsar. 100 cases of acute myocardial infarction (AMI) were included in our study and divided among four groups according to admission blood sugar level. Group I (≤120 mg %), Group II (120-139 mg %), Group III (140-179 mg %) and Group IV (>180 mg %).

Patients with acute myocardial infarction both ST-elevation myocardial infarction (STEMI) and non ST-elevation MI (NSTEMI) proven by history, electrocardiography (ECG) and cardiac enzymes with no previous history of diabetes were included in the study. Patients presenting with history of onset of symptoms within 48 hours were included in the study.

Those patients with pre-existing diabetes, patients who had received dextrose containing intravenous fluids before admission, post-surgical patients, post trauma (up to 1 month) patients, and those with pre-existing history of taking drugs that elevate blood glucose levels e.g. corticosteroids, barbiturates, oral contraceptives and progesterone etc were excluded from our study.

A detailed history and clinical examination of the patients was done and clinical diagnosis of acute myocardial infarction (AMI) was made. Presence and severity of heart failure as outcome in acute myocardial infarction patients was measured using the Killip's classification.[10] Routine baseline investigations along with random plasma glucose, HbA1c, TROP-T, CPK-MB and Lipid profile were performed. Patients were followed throughout the hospital stay for any complication like cardiogenic shock or death.

The above data were collected and tabulated and comparison of admission RBS and mortality was analyzed using version 22 of the Statistical Package for Social Sciences (SPSS, published IBM Inc.). Chi-square test and one way analysis of variance (ANOVA) tests were performed. Bivariate correlation using Pearson's method was used to identify different correlates of death as outcome.

RESULTS:

A total of 100 patients included in the study were divided into four groups (I to IV) of patients depending on the admission RBS. Group I comprised of 31 patients, Group II with 18 patients, Group III with 28 patients, Group IV with 23 patients respectively. Mean age of patients in the present study was 59.53 ±11.55 years with male predominance and male: female ratio of 1.27:1.

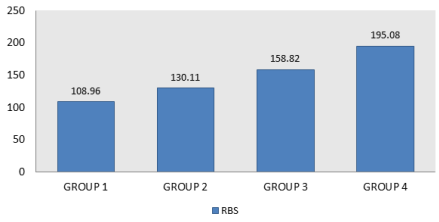
Mean systolic BP at admission was 92 mm Hg in Group IV as compared to 142.51mm Hg in Group I, 131.83 mm Hg in Group II and 138.07 mm Hg in Group III. The mean diastolic BP at admission was 59.04 mm Hg in Group IV as compared to 85.33mm Hg in Group I, 76.11mm Hg in Group II and 84.92 mm Hg in Group III. There was a statistically significant (P<0.0001) difference in the mean systolic BP and mean diastolic BP among groups. While the difference in heart rate among study groups was statistically non-significant.

In the present study, 57% of the study population presented with hypertension. Out of these 22% cases were in group I, 61.1% cases in group II, 50% cases in Group III and 43.5% cases of group IV.

Mean RBS at the time of admission among groups were, Group I –

108.96 , Group II- 130.11, Group III- 158.82, Group IV – 195.08, and the difference was statistically significant (p=0.00001).(Figure 1).

FIGURE 1: MEAN RBS AT TIME OF ADMISSION WITHIN STUDY GROUPS



There was no statistical significant difference in HbA1c, CK-MB and TROP T values across the groups. Incidence of development of cardiogenic shock and mortality were seen to be highest in group IV (65.2% and 60.8% respectively) in our study. This difference was also statistically significant. (table1and 2)

TABLE 1: DEVELOPMENT OF CARDIOGENIC SHOCK IN THE STUDY POPULATION

Cardiogenic Shock	Group I (N=31)	Group II (N=18)	Group III (N=28)	Group IV (N=23)	P value
YES	0	0	0	15 (65.2%)	P<0.05*
NO	31	18	28	8	

TABLE 2: COMPARISON OF HOSPITAL MORTALITY IN THE STUDY POPULATION

Mortality	Group I (N=31)	Group II (N=18)	Group III (N=28)	Group IV (N=23)	P
YES	0	0	0	14 (60.8%)	P=0.001*
NO	31	18	28	9	

On correlation analysis, our study results show that both admission RBS and cardiogenic shock have statistically significant positive correlation with death. While systolic BP and diastolic BP have negative correlation with death as depicted in table 3.

TABLE 3: CORRELATIONS OF VARIOUS CLINICAL PARAMETERS AND MORTALITY

VARIABLE	N	r score (pearson correlation)	P
AGE	100	0.1219	0.226
ADMISSION RBS	100	0.2963	<0.001*
SYSTOLIC BP	100	-0.522	<0.001*
DIASTOLIC BP	100	-0.5275	<0.001*
HEART RATE	100	0.1364	0.175
CK-MB	100	0.1288	0.201
HBA1C	100	0.1307	0.194
TROP T	100	0.0725	0.473
CARDIOGENIC SHOCK	100	0.9625	<0.001*

DISCUSSION:

Mean age of patients in our study was 59.53 years. We observed that as age advanced there was an increase in glycemic status of the patients as well, but this difference was not statistically significant. Many previous studies have also shown that as age advances there is Impaired Glucose Tolerance (IGT).[11,9,12,13] There was an increase in the RBS levels seen across the groups i.e. from group I- IV and this difference was also found to be statistically highly significant.

We observed that patients with higher admission RBS (group IV) were found to have lower systolic BP and diastolic BP at the time of admission.The difference in SBP and DBP within groups was statistically also significant (P<.00001). These findings can be explained by the fact that the patients with higher admission blood glucose levels have a lower LVEF and poorer left ventricular function. Patel et al, Kadri et al, Suleiman and Antman et al have have also shown that patients with higher initial blood glucose levels had lower left ventricular ejection fractions and reduced systolic blood pressures.[9,15,16,8]

In our study 57% population was hypertensive while 43% cases were non-hypertensive. But, we did not observe any relation of increased RBS and hypertension across the study groups. Our results were in accordance with results of Patel et al in their study.[9]

Both CK-MB levels and TROP T levels were seen to be raised across the groups, which is suggestive of AMI but this distribution across the groups was statistically not significant contrary to the study by Suleiman et al who observed higher level of enzymes in patients with higher admission RBS values.[16]

We observed that presence of cardiogenic shock and in hospital mortality was seen only in group IV (65.2% cases and 60.86 respectively) thus suggesting that there is higher risk of development of cardiogenic shock and mortality in subjects with higher admission RBS. Wahab et al and Dziewierz et al also reported similar findings.[7,14]

On Pearson's correlation analysis of different variables, we observed that admission RBS and Cardiogenic shock have statistically significant positive correlation with death while systolic BP and diastolic BP have negative correlation with mortality in AMI.

Hence, the raised admission RBS has an association with in hospital mortality in non-diabetic AMI patients in our study. This finding was in unison with findings of Suleiman et al, Mansour et al, Aronson et al, Oswald et aland Ishihara et al.[16-19]

CONCLUSION:

From the results of our study we conclude that even in non-diabetic patients, hyperglycaemia on admission is independently associated with a higher risk of in-hospital mortality.

FINANCIAL SUPPORT AND SPONSORSHIP: Nil.

CONFLICTS OF INTEREST: There are no conflicts of interest.

REFERENCES:

1. Siegel KR, Patel SA, Ali MK. Non-communicable diseases in South Asia: Contemporary Perspectives. British medical bulletin. 2014; 111(1):31-44.
2. Park K. Chapter: Epidemiology of Chronic Non-communicable Diseases and Conditions. In: Textbook of Preventive and Social Medicine 23rd edition. Banarsidas Bhanot Publishers, Jabalpur Pp: 366-7.
3. Nag T and Ghosh A. Cardiovascular disease risk factors in Asian Indian population: a systematic review. Journal of Cardiovascular Disease Research. 2013;4(4):222-8.
4. Leon BM and Maddox TM. Diabetes and cardiovascular disease: Epidemiology, biological mechanisms, treatment recommendations and future research. World Journal of Diabetes. 2015;6(13):1246-58.
5. Gornik I, Vujaklija-Brajković A, Renar IP and Gašparović V. A prospective observational study of the relationship of critical illness associated hyperglycaemia in medical ICU patients and subsequent development of type 2 diabetes. Critical Care. 2010;14(4):R130.
6. Norhammar A, Tenerz Å, Nilsson G, Hamsten A, Efendíc S, Rydén L and Malmberg K. Glucose metabolism in patients with acute myocardial infarction and no previous diagnosis of diabetes mellitus: a prospective study. The Lancet. 2002;359(9324):2140-4.
7. Wahab NN, Cowden EA, Pearce NJ, Gardner MJ, Merry H, Cox JL, ICONS investigators. Is blood glucose an independent predictor of mortality in acute myocardial infarction in the thrombolytic era? Journal of the American College of Cardiology. 2002;40(10):1748-54.
8. Antman EM and Loscalzo J. Ischemic Heart Disease. In: Harrison'sTM Principles of Internal Medicine. Editors: Jameson JL, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J. 20th edition. McGraw Hill Education, New York. 2018; pp:1850-66.
9. Patel M, Raikood BRP and Chincholi S. Study of blood glucose level on admission as potential indicator for mortality in non-diabetic patients with acute myocardial infarction. IOSR-JDMS 2016;15(9): 44-8
10. Killip T and Kimball JT. Treatment of myocardial infarction in a coronary care unit: a two year experience with 250 patients. The American Journal of Cardiology. 1967;20 (4):457-64.
11. Parkar MA, Chavan C, Lumb R, Pawar SG . Blood glucose levels on admission as potential indicator for mortality during hospital stay in non-diabetic patients presenting with acute myocardial infarction. IJSR 2017; 6 (5):168-71.
12. Stranders I, Diamant M, van Gelder RE, Spruijt HJ, Twisk JW, Heine RJ and Visser FC. Admission blood glucose level as risk indicator of death after myocardial infarction in patients with and without diabetes mellitus. Archives of Internal Medicine. 2004;164(9):982-8.
13. Wong VW, Ross DL, Park K, Boyages SC, Cheung NW. Hyperglycemia: still an important predictor of adverse outcomes following AMI in the reperfusion era. Diabetes Research and Clinical Practice. 2004;64(2):85-91.
14. DziewierzArtur, Giszterowicz D, Siudak Z, Rakowski T, Dubiel JS, Dudek D. Admission glucose level and in-hospital outcomes in diabetic and non-diabetic patients with acute myocardial infarction. Clinical Research in Cardiology. 2010;99(11):715-21.
15. Kadri Z, Danchin N, Vaur L, Cottin Y, Guéret P, Zeller M, Lablanche JM, Blanchard D, Hanania G, Genès N, Cambou JP. Major impact of admission glycaemia on 30 day and one year mortality in non-diabetic patients admitted for myocardial infarction: results from the nationwide French USIC 2000 study. Heart. 2006;92(7):910-5.
16. Suleiman M, Hammerman H, Boulos M, Kapeliovich MR, Suleiman A, Agmon Y, Markiewicz W and Aronson D. Fasting glucose is an important independent risk factor for 30-day mortality in patients with acute myocardial infarction: a prospective study. Circulation. 2005;111(6):754-60.
17. Mansour AA and Wanoose HL. Acute phase hyperglycemia among patients hospitalized with acute coronary syndrome: prevalence and prognostic significance. Oman Medical Journal. 2011;26(2):85-90.
18. Aronson D, Hammerman H, Suleiman M and Markiewicz W. Usefulness of changes in

fasting glucose during hospitalization to predict long-term mortality in patients with acute myocardial infarction. The American Journal of Cardiology. 2009;104(8):1013-7.
19. Oswald GA, Smith CC, Betteridge DJ and Yudkin JS. Determinants and importance of stress hyperglycaemia in non-diabetic patients with myocardial infarction. British Medical Journal (Clin Res Ed). 1986;293(6552):917-22.
20. Ishihara M, Kojima S, Sakamoto T, Asada Y, Tei C, Kimura K, Miyazaki S et al. Acute hyperglycemia is associated with adverse outcome after acute myocardial infarction in the coronary intervention era. American Heart Journal. 2005;150:814.