Original research article

ASSESSMENT OF COMPLICATIONS AND MORTALITY IN AMI PATIENTS WITH DIABETES AND WITHOUT DIABETES: A COMPARATIVE STUDY

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ABSTRACT

Aim: The aim of the present study was to compare complications and mortality in AMI patients with diabetes and without diabetes

Material & methods: A comparative study carried out at Department of Cardiology and General Medicine, during the duration of 24 months. Study population was adult patients admitted with Acute myocardial Infarction. 50 diabetic AMI and 50 non-diabetic AMI were studied in the study for post AMI complication and mortality.

Results: Group-1 consists of 50 cases (35 males and 15 females) and group- 2 consists of 50 cases (40 males and 10 females). Most of the patients in both group diabetic and nondiabetic belonged to age group 45 – 54. The mean random blood sugar in diabetes group in male and female were 232.4±92.84 and 244.66±85.25 respectively. Maximum number of cases of Stable angina belonged to Non-Diabetic group (64%) and Unstable angina and MI belonged to Diabetic group (28% and16%) respectively. There was a significant association between types of AMI among the diabetic and the non-diabetic groups ($P<0.001$). Among the diabetic patients total 40 (80%) patients had complications. In the non diabetic patients complications were observed in 30 (60%). Pump failure was most common complication followed by sinus tachycardia in diabetic patients. Among the non diabetic patients, sinus tachycardia was most commonly observed followed by bradycardia. There was a significant association between diabeties and complications ($p<0.05$).

Conclusion: The present study concluded that Post MI complications and Mortality is significantly more among diabetics compared to among non diabetics.

Keywords: Diabetes mellitus, complications, AMI

INTRODUCTION

Acute myocardial infarction (AMI) is one of the leading cause of all acute emergencies and is becoming an important public health problem in the developing countries.[1] Diabetes mellitus (DM) is a growing epidemic that has affected people from all regions and has become a rising global burden. [2] It has affected the health condition of millions as well as developed into a financial liability internationally. This chronic condition seems to affect all systems of the body, but the most common cause of death and disability was due to cardiovascular disease. [2] Although coronary artery disease (AMI) and diabetes mellitus have been recognized as distinct entities for many decades, but their correlation was established only in 1870 after the work of Seegen.J. Der. Who emphasized higher incidence and mortality of AMI among diabetics. [3]

Diabetes mellitus (DM) is a frequent comorbidity among patients hospitalized with acute myocardial infarction (AMI), [4,5,6] People with DM have a higher prevalence of coronary artery disease (CAD) leading to an increased risk of myocardial infarction (MI), mortality, and other cardiopulmonary complications.[7] It has been shown that patients following AMI exhibited increased mobilization of endothelial progenitor cells (EPCs) from the bone marrow. [8] These EPCs, once mobilized into the peripheral circulation and are involved in the maintenance of endothelial homoeostasis and new vessel formation. [9,10,11] Circulating EPCs level and function are predictive for prognosis following AMI, correlate with cumulative cardiovascular risk, cardiovascular mortality and atherosclerosis progression in patients with coronary artery disease. [12,13,14,15,16] The defect in the mobilization, recruitment and function of EPCs are hallmark features in diabetes and EPCs alterations served a pathogenic role in the development of diabetic complications. The risk of AMI is 2-4 times higher in diabetics. The coronary artery disease is much more serious in diabetics with about 4 times higher morbidity/mortality in men, while 8 times in women. [17,18] Acute pulmonary edema, cardiogenic shock, arrhythmia, re-infarction and cerebral infarction are serious complications in diabetics. [19] The symptoms of AMI are late in diabetics, thus causes delay in fibrinolytic therapy and PTCA. It has been reported that diabetic patients with AMI should be administered thrombolytic agents very early. Such a practice can reduce mortality in them. [20,21] The prevalence of AMI in Indians is higher than in any other population in the world. In the recent past, the prevalence has risen from 1.5-6.5% to 8-12%. There is difference in the prevalence of AMI in urban and rural India (8-9.6% to 3.5%) more common in south than north India. The incidence of AMI in diabetic men is twice and four times more common in diabetic woman. The risk of AMI among diabetic patients is directly related to the levels of blood pressure, cigarette smoking and total cholesterol. [22,23] Myocardial infarction, a prime cause of morbidity and mortality all over the world is several-fold more common in patients with diabetes than those without it.

Hence the aim was to compare complications and mortality in AMI patients with diabetes and without diabetes.

MATERIAL & METHODS

A cross sectional study carried out at Department Of Cardiology and General Medicine, Indira Gandhi Institute of Medical Sciences, Sheikhpura, Patna, Bihar, India during the duration of 24 months. Study population was adult patients admitted with Acute myocardial Infarction. 50 diabetic AMI and 50 non-diabetic AMI were studied in the study for post AMI complication and mortality.

Inclusion criteria:

1. Patients with age more than 12 years.
2. Patients with diabetes as cases and non-diabetic patients as control group
3. Patients willing to participate in the study

Exclusion criteria:

1. Patients with age above 12 years
2. Patients having impaired Fasting Glucose [FPG < 126mg/dl. But > 110 mg/dl, PP-PG 140 –200mg/dl]

METHODOLOGY

A valid written consent was taken after explaining study to them. 100 cases of AMI were studied, out of which 50 cases are diabetic AMI (Group 1) and 50 cases are nondiabetic AMI (group 2). Sample is drawn by simple random technique. Previously known diabetic or first time detected diabetic by American diabetic association (ADA) criteria, 2018, presenting with AMI were included in group 1 and Cases presenting with myocardial infarction who are not known diabetics or not fulfilling ADA were included in group 2. Data was collected with pre tested questionnaire. After fulfilling the inclusion and exclusion criteria patients were recruited. Detailed clinical history was noted. History included duration and control of diabetes, presence of risk factors like smoking, hypertension, and family history of IHD. If any complications of hypertension or diabetes in past it was noted. A through clinical examination was done. Vital signs like pulse (rhythm disturbance) BP (look for hypertension/ hypotension) were noted. Routine investigations like Routine blood and urine RBS, FBS and PPBS And Glycosylated Hb was done. Lipid profile, renal function tests, fundus examination was done. Patients were stabilised by medical management. Complications observed were Pump failure (LVF ± Cardiogenic shock), Rhythm disturbances (Ventricular / atrial) and Co-morbid complication (e.g. Stroke). Outcome in both the group was compared in terms of complications and mortality.

STATISTICAL ANALYSIS

Data was entered in excel sheet. Data was analysed with SPSS version 22.

RESULTS

Table 1: Distribution of diabetic and non diabetic patients according to age and sex

Age group (years)	**Diabetic**		**Non- Diabetic**		**Total**
	Male	**Female**	**Male**	**Female**	
35 – 44	3	1	1	1	6
45 – 54	14	3	12	5	34

55 – 64	7	6	17	2	32
65 – 74	8	3	6	1	18
75 and above	3	2	4	1	10
Total	**35**	**15**	**40**	**10**	**100**

Group-1 consists of 50 cases (35 males and 15 females) and group- 2 consists of 50 cases (40 males and 10 females). Most of the patients in both group diabetic and nondiabetic belonged to age group 45 – 54.

Table 2: Random blood sugar levels according to diabetic status and sex

Groups	**Males**	**Females**	**Total**
Diabetics	232.4±92.84	244.66±85.25	236.4±93.7
Non-diabetics	130.4±62.4	126±45.25	125.65±52.6

The mean random blood sugar in diabetes group in male and female were 232.4±92.84 and 244.66±85.25 respectively.

Table 3: Distribution of patients according to type of CAD

AMI	**Diabetic**		**Non-diabetic**	
	N	**%**	**N**	**%**
Stable angina	28	56	32	64
Unstable angina	14	28	11	22
Myocardial infarction	8	16	7	14
Total	50	100	50	100

Maximum number of cases of Stable angina belonged to non-diabetic group (64%) and Unstable angina and MI belonged to Diabetic group (28% and16%) respectively. There was a significant association between types of AMI among the diabetic and the non-diabetic groups ($P<0.001$).

Table 4: Post MI complications and death in diabetic and non-diabetic patients

Complications	Diabetic			Non-diabetic		
	Total	Recover	Death	Total	Recover	Death
Sinus tachycardia	12	12	0	15	15	0
Pump failure (pulmonary edema/	14	6	8	6	1	5
cardiogenic shock/both)						
Bradycardia	8	7	1	3	3	0
Fatal ventricular arrhythmia	2	1	1	4	1	3
Acute VSD/MR	2	1	1	0	0	0
Other stroke	2	1	1	2	0	2
Total	40	28	12	30	20	10

Among the diabetic patients total 40 (80%) patients had complications. In the non diabetic patients complications were observed in 30 (60%). Pump failure was most common complication followed by sinus tachycardia in diabetic patients. Among the non diabetic patients, sinus tachycardia was most commonly observed followed by bradycardia. There was a significant association between diabetes and complications ($p<0.05$).

DISCUSSION

The latest estimates show a global prevalence of 382 million people with diabetes in 2013, expected to rise to 592 million by 2035. The aetiological classification of diabetes has now been widely accepted. Type 1 and type 2 diabetes are the two main types, with type 2 diabetes accounting for the majority (>85%) of total diabetes prevalence. Both forms of diabetes can lead to multisystem complications of microvascular endpoints, including retinopathy, nephropathy and neuropathy, and macrovascular endpoints including ischaemic heart disease, stroke and peripheral vascular disease. The premature morbidity, mortality, reduced life expectancy and financial and other costs of diabetes make it an important public health condition. Type-2 diabetes accounts for over 95% of all diabetics in India. Due to its insidious onset and lack of alarming symptoms, the disease often remains undiagnosed for many years. Type-2 diabetes mellitus has significant relationship with obesity and almost 90% type-2 diabetics are obese although only a minority of obese people are diabetic. Dyslipidemia is observed in practically all patients of type-2 diabetes mellitus and very high level of cholesterol in diabetics have 2-3 times higher AMI risk than non-diabetic individuals.[24]

Group-1 consists of 50 cases (35 males and 15 females) and group- 2 consists of 50 cases (40 males and 10 females). Most of the patients in both group diabetic and nondiabetic belonged to age group 45 – 54. Malmberg et al[25] noted the same results and noted that females are commonly involved, which is also seen in our study. The mean random blood sugar in diabetes group in male and female were 232.4±92.84 and 244.66±85.25 respectively. Maximum number of cases of Stable angina belonged to Non-Diabetic group (64%) and Unstable angina and MI belonged to Diabetic group (28% and16%) respectively. There was a significant association between types of AMI among the diabetic and the non-diabetic groups ($P<0.001$). Hong et al[26] reported similar results that is acute coronary syndrome that is unstable angina and myocardial infarction is more common in diabetic than non- diabetics.

Among the diabetic patients total 40 (80%) patients had complications. In the non diabetic patients complications were observed in 30 (60%). Pump failure was most common complication followed by sinus tachycardia in diabetic patients. Among the non diabetic patients, sinus tachycardia was most commonly observed followed by bradycardia. There was a significant association between diabetes and complications ($p<0.05$). The FAST-MI (French registry of Acute ST elevation or non-ST-elevation Myocardial Infarction) registry showed that 37.5% of AMI patients had HF; these patients, compared with MI patients without HF, had a significantly increased risk of death during index hospitalization (12.2% vs. 3.0%).[27]

In the Multiple Risk Factor Intervention Trial (MRFIT), men with diabetes had a threefold higher absolute risk of cardiovascular death than non-diabetic men (160 vs 53 cardiovascular deaths per 10 000 person-years) even after controlling for age, race, income, cholesterol levels, blood pressure and smoking.[28] The Framingham Study 20-year follow-up similarly demonstrated that patients with diabetes not only had a higher mortality with their index event, they also had a higher incidence of re infarction and heart failure in the acute and post infarction periods.[29] The FINMONICA Study, which looked at out-of-hospital deaths as well as deaths from index admission, showed that while diabetic women have a higher in-hospital

and 1-year mortality, diabetic men have a higher overall mortality due to out-of-hospital death.[30]

CONCLUSION

The present study concluded that Post MI complications and Mortality is significantly more among diabetics compared to among non diabetics.

REFERENCES

1. Hampton JR, A Gray RG. The future of general medicine: lessons from an admissions ward. Journal of the Royal College of Physicians of London. 1998 Jan;32(1):39.
2. International Diabetes Federation, IDF Diabetes Atlas 7th Edition, International Diabetes Federation, 2015.
3. Nathan DM, Meigs J, Singer DE. The epidemiology of cardiovascular disease in type 2 diabetes mellitus: how sweet it is… or is it?. The Lancet. 1997 Jul 1;350:S4-9.
4. Rawshani A, Rawshani A, Franzén S, Sattar N, Eliasson B, Svensson AM, Zethelius B, Miftaraj M, McGuire DK, Rosengren A, Gudbjörnsdottir S. Risk factors, mortality, and cardiovascular outcomes in patients with type 2 diabetes. New England Journal of Medicine. 2018 Aug 16;379(7):633-44.
5. Rawshani A, Rawshani A, Franzén S, Eliasson B, Svensson AM, Miftaraj M, McGuire DK, Sattar N, Rosengren A, Gudbjörnsdottir S. Mortality and cardiovascular disease in type 1 and type 2 diabetes. New England journal of medicine. 2017 Apr 13;376(15):1407-18.
6. Marenzi G, Cosentino N, Genovese S, Campodonico J, De Metrio M, Rondinelli M, Cornara S, Somaschini A, Camporotondo R, Demarchi A, Milazzo V, Moltrasio M, Rubino M, Marana I, Grazi M, Lauri G, Bonomi A, Veglia F, De Ferrari GM, Bartorelli AL. Reduced cardio-renal function accounts for most of the Baviera et al. Cardiovascular Diabetology (2022) 21:223 Page 9 of 9 in-hospital morbidity and mortality risk among patients with type 2 diabetes undergoing primary percutaneous coronary intervention for ST-segment elevation myocardial infarction. Diabetes Care. 2019;42:1305–11
7. Altamirano R, Caponigro M, Carrion G, Zevallos JC, Castro G, Gonzalez Sanchez JA, Barengo NC. Incidence of Acute Myocardial Infarction in Patients with Diabetes and Its Association with Mortality and Cardiopulmonary Complications in Puerto Rico.
8. Schmidt-Lucke C, Rossig L, Fichtlscherer S, Vasa M, Britten M, et al. (2005) Reduced number of circulating endothelial progenitor cells predicts future cardiovascular events: proof of concept for the clinical importance of endogenous vascular repair. Circulation 111: 2981–2987.
9. Werner N, Kosiol S, Schiegl T, Ahlers P, Walenta K, et al. (2005) Circulating endothelial progenitor cells and cardiovascular outcomes. N Engl J Med 353: 999–1007.
10. Leone AM, Valgimigli M, Giannico MB, Zaccone V, Perfetti M, et al. (2009) From bone marrow to the arterial wall: the ongoing tale of endothelial progenitor cells. Eur Heart J 30: 890–899.

11. Asahara T, Murohara T, Sullivan A, Silver M, van der Zee R, et al. (1997) Isolation of putative progenitor endothelial cells for angiogenesis. Science 275: 964–967.
12. Leone AM, Rutella S, Bonanno G, Abbate A, Rebuzzi AG, et al. (2005) Mobilization of bone marrow-derived stem cells after myocardial infarction and left ventricular function. Eur Heart J 26: 1196–1204.
13. Prasad A, Stone GW, Stuckey TD, Costantini CO, Zimetbaum PJ, et al. (2005) Impact of diabetes mellitus on myocardial perfusion after primary angioplasty in patients with acute myocardial infarction. J Am Coll Cardiol 45: 508–514.
14. Kissel CK, Lehmann R, Assmus B, Aicher A, Honold J, et al. (2007) Selective functional exhaustion of hematopoietic progenitor cells in the bone marrow of patients with postinfarction heart failure. J Am Coll Cardiol 49: 2341–2349.
15. Hill JM, Zalos G, Halcox JP, Schenke WH, Waclawiw MA, et al. (2003) Circulating endothelial progenitor cells, vascular function, and cardiovascular risk. N Engl J Med 348: 593–600.
16. Chironi G, Walch L, Pernollet MG, Gariepy J, Levenson J, et al. (2007) Decreased number of circulating CD34+KDR+ cells in asymptomatic subjects with preclinical atherosclerosis. Atherosclerosis 191: 115–120.
17. Dirkali A, van der Ploeg TJ, Nangrahary M, Cornel JH, Umans VA. The impact of admission plasma glucose on long-term mortality after STEMI and NSTEMI myocardial infarction. International journal of cardiology. 2007 Oct 1;121(2):215-7.
18. Pitsavos C, Kourlaba G, Panagiotakos DB, Stefanadis C. Characteristics and in-hospital mortality of diabetics and nondiabetics with an Acute Coronary Syndrome; the GREECS study. Clinical Cardiology: An International Indexed and Peer-Reviewed Journal for Advances in the Treatment of Cardiovascular Disease. 2007 May;30(5):239-44.
19. Lindeman RD, Romero LJ, Hundley R, Allen AS, Liang HC, Baumgartner RN, Koehler KM, Schade DS, Garry PJ. Prevalences of type 2 diabetes, the insulin resistance syndrome, and coronary heart disease in an elderly, biethnic population. Diabetes Care. 1998 Jun 1;21(6):959-66.
20. Javed I, Iqbal MJ, Arshad S, Javed MT, Masood Z. A study on Acute Myocardial Infarction with special reference to age, sex, type of infarct and associated risk factors.
21. Tjandrawidjaja MC, Y Fu, Goodman SG, Van De, Werf F, Granger CB: The impact of gender on the treatment and outcomes of patients with early reinfarction after fibrinolysis insights from ASSENT-2. Eur Heart J, 24: 1024-34, 2003.
22. Gaede P, Vedel P, Larsen N, Jensen GV, Parving HH, Pedersen O. Multifactorial intervention and cardiovascular disease in patients with type 2 diabetes. N Engl J Med. 2003;348:383–393.
23. Ahmed I, Goldstein BJ. Cardiovascular risk in the spectrum of type 2 diabetes mellitus. Mt Sinai J Med.2006;73:759–768.
24. DIAMOND Project Group. Incidence and trends of childhood type 1 diabetes worldwide 1990–1999. Diabetic medicine. 2006 Aug;23(8):857-66.
25. Malmberg K, Rydén L, Efendic S, Herlitz J, Nicol P, Waldenstrom A, Wedel H, Welin L, DIGAMI Study Group. Randomized trial of insulin-glucose infusion followed by

subcutaneous insulin treatment in diabetic patients with acute myocardial infarction (DIGAMI study): effects on mortality at 1 year. Journal of the American College of Cardiology. 1995 Jul 1;26(1):57-65.

26. Hong YJ, Jeong MH, Choi YH, Song JA, Ahmed K, Kim DH, Lee KH, Lee MG, Park KH, Sim DS, Yoon NS. Relationship Between Microalbuminuria and Vulnerable Plaque Components in Patients With Acute Coronary Syndrome and With Diabetes Mellitus–Virtual Histology-Intravascular Ultrasound–. Circulation Journal. 2011;75(12):2893-901.
27. Juilliere Y, Cambou JP, Bataille V, Mulak G, Galinier M, Gibelin P, Benamer H, Bouvaist H, Meneveau N, Tabone X, Simon T. Heart failure in acute myocardial infarction: a comparison between patients with or without heart failure criteria from the FAST-MI registry. Revista Española de Cardiología (English Edition). 2012 Apr 1;65(4):326-33.
28. Stamler J, Vaccaro O, Neaton JD, Wentworth D, Multiple Risk Factor Intervention Trial Research Group. Diabetes, other risk factors, and 12-yr cardiovascular mortality for men screened in the Multiple Risk Factor Intervention Trial. Diabetes care. 1993 Feb 1;16(2):434-44.
29. Kannel WB, McGee DL. Diabetes and cardiovascular disease: the Framingham study. Jama. 1979 May 11;241(19):2035-8.
30. Miettinen H, Lehto S, Salomaa V, Mähönen M, Niemelä M, Haffner SM, Pyörälä K, Tuomilehto J, FINMONICA Myocardial Infarction Register Study Group. Impact of diabetes on mortality after the first myocardial infarction. Diabetes care. 1998 Jan 1;21(1):69-75.