# A COMPARISON BETWEEN PATIENTS OF ACUTE MYOCARDIAL INFARCTION ALONE OR WITH OTHER CARDIOVASCULAR DISEASES AND PATIENTS OF ACUTE MYOCARDIAL INFARCTION WITH TYPE 2 DIABETES

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## ABSTRACT

**Objective:** Coronary artery disease is the major cause of morbidity and mortality in type 2 diabetics as compared to general population. To know the demographic and in patients treatment difference between patient of myocardial infarction alone and those with type-II diabetes and other cardiovascular diseases.

**Material and Methods:** A one-year, hospital-based prospective cohort study was conducted at coronary care unit of Lady Reading Hospital, Peshawar. Main Outcome measures were to assess demographic and in-patient treatment/ mortality differences between patients of myocardial infarction (MI) alone or with other cardiovascular diseases (CVD, group 1) and patients of MI with type 2 diabetes (group 2).

**Results:** A total of 506, patients, with an episode of MI, mean age 57.5 (11.2 S.D.) years, were admitted during one year period. Off 506 patients, 152 (30%) had type 2 diabetes with mean duration 7.8 (7.9 S.D.) years and 354 (70%) had MI alone or with other CVD. Between-group analysis indicated that in-patient mortality was statistically greater in, group 1 as compared to group 2 (Relative Risk, 3.972; 95% CI 1.44 - 10.94). Within-group analysis indicated that raised systolic and diastolic blood pressure were statistically associated with higher in-patient mortality in, group 1 (0.001 and 0.007, Wilcoxon matched pair test, respectively).

**Conclusion:** Our results have shown higher in-patient mortality in patients of MI alone or with other CVD as compared to patients of MI

with type 2 diabetes. Do we have a higher rate of instant (sudden/ street) deaths in type 2 diabetics as compared to general population?

**Key words:** Acute Myocardial infarction, Type-II diabetes, Other cardiovascular diseases.

# INTRODUCTION

Diabetes is an incurable chronic disease and is the seventh leading cause of death (and sixth leading cause of death by disease) in USA[1]. In the last 25 years DM has emerged as a 'third world' problem, causing a severe strain on the evolving health economy of many developing countries and their health care systems[2]. A study conducted by Shera et al.[3] in rural areas of N.W.F.P, as part of the Pakistan National Diabetes Survey by WHO, indicated that the overall prevalence of type 2 diabetes and impaired glucose tolerance (IGT) in both sexes is 11.1% and 9.4%, respectively, and concluded that diabetes mellitus in rural areas of N.W.F.P is rising.

Compared with individuals without diabetes, diabetic patients have a two- to fourfold increased risk of coronary heart disease (CHD[4-5]). Diabetic patients also have an approximately two-fold higher risk of short-term mortality after acute myocardial infarction (MI), even after adjustment for the extent of CHD[6]. In addition, there is evidence that patient with diabetes have poorer prognosis than patients without diabetes after MI[7-9]. Increased mortality in diabetes may have several explanations. First diabetic patients may experience more severe coronary inoculate atherosclerosis than non-diabetic patients. Second, left ventricular dysfunction and cardiac failure, as complications of MI are more common in diabetic than in non-diabetic patients. Third, diabetic patients are more likely than non-diabetic patients to have fetal arrhythmias after MI.

Epidemiological research has shown that DM is a well-established factor in the pathogenesis of atherosclerosis and acts as a strong risk factor for illness and death due to CHD[10-12]. The issue of the association between diabetes and CHD is likely to become more important for two reasons. First, the incidence of type 2 diabetes is increasing among both high-risk and low-risk populations[13]. Second, although there has been a marked decline in the rate of deaths due to CHD in the overall population over the past 35 years, this has been much less among patients with diabetes[14]. The reason for the difference is not clear but there are several possibilities. First, it may be that patients with diabetes have not benefited from reductions in risk factors for cardiovascular disease. This possibility seems not to be the case, since reduction in the risk factor of CHD resulting from lipid reduction[15] and blood pressure reduction[16] is similar for those with and without diabetes. According to recent recommendations, the treatment of dyslipidemia[1] and high blood pressure[17] in patients with diabetes should be as aggressive as those with pre-existing CHD. The case for intensive glycaemic control is more compelling in the period immediately after a MI, during which a significant reduction in mortality was observed in a one-year RCT[18].

As many studies suggested that patients with diabetes are more likely to have increased level of risk factors for CHD as compared to non diabetic patients[4-6]. It is not clear whether poorer survival among diabetic patients after MI is attributable to diabetes per se or unfavorable risk factors profile.

A hospital-based prospective cohort study was designed at Coronary Care Unit (CCU), Lady Reading Hospital (LRH), Peshawar to determine in-patient treatment and mortality differences between patients of MI alone or with other cardiovascular disease (CVD, group 1) and patients of MI and type 2 diabetes for at least one-month duration at the time of admission.

# MATERIAL AND METHODS

## *Study design and sampling*

A hospital-based two-group descriptive cohort study of one-year duration was conducted at CCU, LRH. A consecutive sample of 506 patients with MI admitted to CCU, between 1st May 2000 – 30th April 2001. Study subjects were divided into two groups; patients of MI alone or with other CVD (354, group 1) and patients of MI with type 2 diabetes for at least one month duration at the time of admission to CCU (152, group 2).

## *Case definition*

Patients were considered to have MI if they fulfilled the World Health Organization (WHO) criteria for MI. The WHO classic definition of myocardial infarction requires that at least two of the following three criteria are met: a history of typical symptoms of ischaemic chest discomfort, evolutionary electrocardiographic tracings involving the development of Q waves, and an increase in the creatinine kinase level greater than twice the upper reference limit[19]. Patients were considered to have other secondary diagnosis like diabetes mellitus and hypertension if they had a previous history of disease (stated in medical records) or were on medication like insulin and/ or oral hypoglycemic agents at the time of admission to CCU.

## *Study population*

Study subjects were recruited from discharge summaries produced by computer database and baseline questionnaires were filled every three months for patients admitted to CCU with confirmed MI. Patients' records were checked and verified with CCU admission books and ward registers.

## *Inclusion criteria*

- Confirmed diagnosis of MI
- Confirmed diagnosis of type 2 DM and other secondary diagnosis
- Diabetes duration 1 or > 1 month
- Age 30-80 years old
- Subjects admitted to CCU between 1st May 2000 to 30th April 2001.
- Local residents
- Subjects without mental disorders.

## *Study Tool*

A 32 item structured questionnaire was used to collect information on study subjects at the time of admission to CCU. Eleven (34.37%) questions were on subjects' demographics, 7 (21.87%) were on subject's past medical history of other secondary diagnosis like diabetes & its treatment, and the remaining 14 (43.75%) questions were related to their acute medical condition (MI symptoms/ presentation, diagnosis, investigation and treatment) and their outcome at the time of admission.

## *Statistical Analysis*

Data analysis and the summary statistics were carried out by SPSS version 10.0 for Window. Association among different risk factors and dependent variables was measured by Chi Square test. Between-group

analysis was carried out by Mann-Whitney U test and Within-group analysis was carried out by Wilcoxon matched pair test.

# RESULTS

A total of 506 patients, with an episode of MI, mean age 57.5 (11.2 S.D.) years, were admitted during one year period. Off 506 patients, 354 (70%) had MI alone or with other CVD (group 1) and 152 (30%) patients had type 2 diabetes (group 2) at the time of admission. The mean duration of diabetes on admission was 7.8 (7.9 S.D.) years.

The number of admissions to the CCU, throughout the year, by calendar month in the study cohort (n = 506), between the two groups, is shown in Figure 1. The majority, 230 (64%), of patients in group 1 were admitted during the winter months (January-March & October-December) as compared to 124 (36%) patients during the April-August months. Whereas, majority of diabetic patients 104 (68%) in group 2 were admitted during the April-August months as compared to 48 (32%) patients during the January-March & October-December months.

Table 1. Illustrates the mean (S.D.) for continuous variables between the two groups.

## *Between-group analysis*

Figure 2 illustrates the distribution of age between the two groups. Patients in

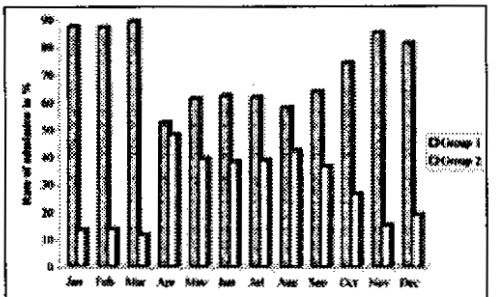

Fig. 1. Illustrates seasonality between patients of MI alone or with other CVS diseases and patients of MI with diabetes.

group 1 were statistically older (mean 57.3, S.D. 11.7) than patients in group 2 (mean 54.5, S.D. 8.4; 0.014, Mann-Whitney U test).

Figure 3 illustrates the distribution of gender between the two groups. Group 1 had statistically higher number of male patients 264 (75%) as compared to group 2 (72, 47%; <0.0001, Pearson Chi-Square test).

In group 1, a total of 312 patients (207 male and 102 female) received Aspirin treatment, 335 patients (248 male and 87 female) received beta-blockers, 149 patients (89 male and 60 female) received thrombolysis. In group 2, a total of 140 patients (67 male and 73 female) received Aspirin treatment, 148 patients (77 male and 71 female) received beta-blockers, 129 patients (62 male and 67 female) received both Aspirin and beta-blockers, 109 patients (51 male and 58 female) received thrombolysis, and only 5 patients (1 male and 4 female) received either

**ILLUSTRATES THE DISTRIBUTION OF MEAN (S.D.) FOR CONTINUOUS VARIABLES BETWEEN THE TWO GROUPS**

| Continuous Variables | Group 1 | Group 2 |
|---|---|---|
| Systolic blood pressure (mmHg) | 127 (32) | 123 (24) |
| Diastolic blood pressure (mmHg) | 82 (21) | 78 (14) |
| Pulse rate (per minute) | 80 (23) | 77 (15) |
| Blood Urea (mg%) | 75 (37) | 35 (23) |
| Random blood glucose (mg%) | 118 (56) | 215 (63) |

TABLE 1

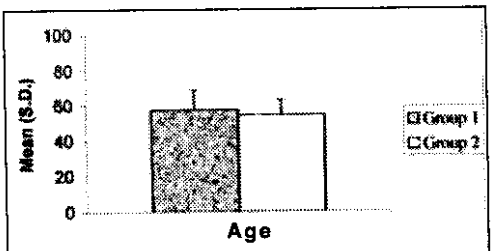


Fig. 2. Illustrates age mean (S.D.) distribution between patients of MI alone or with other CVS diseases and patients of MI with diabetes.

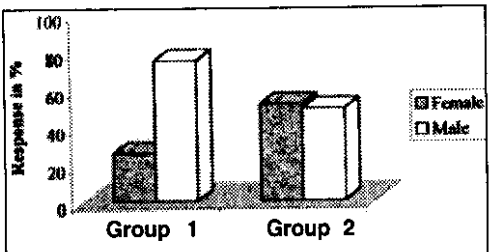


Fig. 3. Illustrates gender distribution between patients of MI alone or with other CVS diseases and patients of MI with diabetes.

insulin injection or oral hypoglycaemic agents (OHA). No statistical associations were found between the two groups regarding their in-patient treatment on admission.

Table 2. Illustrates the distribution of secondary diagnosis in the study cohort.

Of 506 patients, 41 (8.1%) died during their stay at the hospital. Of those 41 patients 37 patients died in group 1 as compared to 4 diabetic patients in group 2. In-patient mortality was statistically greater in group 1 as compared to group 2 (Relative Risk, 3.972; 95% CI 1.44 - 10.94).

## *Within-group analysis*

Non-parametric analysis indicated that raised systolic and diastolic blood pressure were statistically associated with higher in-patient mortality in group 1 (0.001 and 0.007, Wilcoxon matched pair test, respectively). However, both raised systolic and diastolic blood pressure were not statistically associated with in-patient mortality in group 2 (0.0591 and 0.086, respectively, Wilcoxon matched pair test). Random blood glucose level was not associated with higher in-patient mortality in both groups (0.648 and 0.976, Wilcoxon matched pair test, respec-

**ILLUSTRATES THE DISTRIBUTION OF SECONDARY DIAGNOSIS IN TOTAL NUMBER BETWEEN MALE AND FEMALE (NUMBER, %)**

| Secondary Diagnosis | Number | Male (%) | Female (%) |
|---|---|---|---|
| No diagnosis | 247 | 189 (55.9) | 58 (34.5 |
| Type 2 diabetes | 152 | 74 (21.9) | 78 (48.4) |
| Hypertension | 56 | 35 (10.4) | 21 (12.5) |
| Unstable angina | 15 | 11 (3.3) | 4 (2.3) |
| Congestive cardiac failure | 8 | 6 (1.8) | 2 (1.2) |
| Valvular disease | 5 | 3 (0.9) | 2 (1.2) |
| Cerbrovascular accidents | 5 | 4 (1.2) | 1 (0.6) |
| Left ventricular failure | 4 | 4 (1.2) | – |
| Chronic Obstructive Pulmonary disease | 3 | 3 (0.9) | – |
| Infections | 6 | 6 (2.6) | – |
| Complete Heart Block | 5 | 4 (1.2) | 1 0.6) |

TABLE 2

tively). Statistically significant correlation coefficient was shown when diastolic blood pressure as a whole was compared with random blood glucose level (0.018, Non-Parametric Correlation).

# DISCUSSION

Our study was the first 2 group prospective cohort study of patients admitted to CCU with an episode of MI alone or with other CVD or previously known type 2 diabetes conducted in Peshawar to determine in-patient mortality and treatment differences between the two groups. Our results have shown higher in-patient mortality in group 1 as compared to group 2. It may indicate that we have a higher incidence of sudden (street) deaths in patients with type 2 diabetes. The increased risk of sudden death in diabetic patients is likely to be due to several causes, among the diabetic neuropathy, prolonged QT depression, increase heart rate and structural defects such as left ventricular hypertrophy (LVH)[28]. Sudden death may also be due to plaque rupture, with the hypercoagulation of diabetes play a part.

Previously a cross-sectional survey was conducted by Hashim et al.[20] to determine the prevalence of macrovascular complications associated with diabetes and their relation with age, duration of diabetes and metabolic control. Ischaemic heart disease (IHD, 19.8%) associated with diabetes was the commonest complication in Wah Cantt, Rawalpindi (Pakistan) and the prevalence increased with increasing age. Zarger et al.[21] retrospectively studied the trends of mortality in diabetes in Kashmir Valley of India. They collected data by screening the hospital records of all diabetic patients who were admitted to the hospital and died between, 1987 - 1996. According to their findings the most common cause of death in diabetic patients was infections (33.8%), followed by chronic renal disease (30.9%), coronary artery disease (16.4%), cerebrovascular disease (13.7%), hypoglycaemia (7.8%), diabetic ketoacidosis (6.7%), and hyperosmolar coma (2.2%).

Diabetes increases the case fatality rate of MI events[22] and pre-hospital mortality from acute coronary events is higher among people with diabetes[23]. The studies on mortality in people with diabetes in Western countries and Japan have shown that cardiovascular and cerebrovascular diseases are the leading causes of death[21]. The WHO multinational study of vascular diseases in diabetics (age 35 – 54 years, data completed from ten countries in ten years) indicated that mortality rates were lower for all Asian people (Indians, Bangladesh & Japanese) with diabetes as compared to Europeans e.g. age adjusted Europe VS Asian 10.4 VS 7.1 per 100 population[24].

Our results also indicated that both systolic and diastolic blood pressure were statistically associated with higher mortality in group 1. One interpretation would be that hypertension usually occurs in conjunction with other metabolically linked associated risk factors (ARF's); higher levels of total cholesterol, body mass index (BMI), heart rate (HR), glycaemia, and triglycerides[25-26]. Therefore, increased mortality in group 1 patients may be associated with high blood pressure as well as other ARF's. Recent mortality data (1988-1992) for England and Wales showed that mortality from hypertension among British Asians is 1.5 times the national rates (Raleigh, in Press). Diabetes and hypertension are major underlying causes of end-stage renal failure. Additionally, it was shown that there is a three to fourfold excess mortality from end-stage renal disease among Asian and Afro-Caribbean diabetics (Raleigh, in Press).

To minimize the case definition problem, we only included diabetic patients who were on anti-diabetic treatment or who had

diabetes for at least one-month duration at the time of admission. To reduce the measurement error self-reporting of diabetes or diabetes with only diet restriction were not included. To reduce error from recording single measurements of blood glucose level, we used the highest blood glucose level recorded during patients' stay at the hospital.

To reduce selection bias we used standard criteria for inclusion of subjects in our study. For myocardial infarction we used the WHO definition of MI (Methods section) used in the MONICA study[19].

The strengths of our study are confirmed MI cases and confirmed diagnosis of DM for at least one or > 1 month duration. The data extraction was undertaken by a single individual to ensure consistency in interpretation of the discharge summaries and case records (if needed) and also ensured that each record should be examined the same way.

Our results may not be generalizable to the general population or for those patients with diabetes and an episode of MI, who could not afford hospital admission or could not reach in time to the CCU. However so far no observational (population-based) or experimental (like DIGAMI trial to determine the survival in insulin treated diabetic patients) study has been done in this population to look for in-patient treatment/ mortality differences between patients of acute myocardial infarction alone or with other cardiovascular diseases and patients of acute myocardial infarction with previously known type 2 diabetes for at least one month duration at LRH CCU, Peshawar. We did not collect data on certain variables like lipid levels, family history of CHD, smoking history, physical activity, socioeconomic status, and body mass index (BMI, height, weight and hip-waist ratio). These parameters would be of value to look at their relationship with outcomes in patients with diabetes as they are closely associated with type 2 diabetes and will have some effects on the health related outcomes in previously known diabetics with MI.

## CONCLUSION

The information generated by this study has made an initial contribution to the research question of in-patients treatment/ mortality differences between patients with MI and other CVD and patients with MI and previously known type 2 diabetes in Peshawar, admitted to CCU. In-patient mortality in our study appeared to be most heavily influenced by raised systolic and diastolic blood pressure as compared to previous history of type 2 diabetes. Our study indicated significant difference in in-patient mortality, to which our local health services must respond. These findings support the need for aggressive primary and secondary prevention measures to be tested out in individuals and populations with hypertension and diabetes, education about diabetes and hypertension, modification of behavioral risk factors, early diagnosis, effective glycaemic and blood pressure control are essential preventive measures. To reduce human costs associated with diabetes and hypertension, effective educational programmes and in particular the future need for more large observational and experimental studies has to grow effectively. Priority needs to be given on national health programmes for the development of new schemes to prevent premature morbidity and mortality associated with cardiovascular diseases.

## ACKNOWLEDGEMENTS

We wish to thank Professor Waheed Ahmad Sahibzada Head of Coronary Care Unit, Lady Reading Hospital, for making this work possible and for his continued support. We are thankful to the senior

coronary care unit staff and the computer technician for helping us in completing this research by providing their experienced support.

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