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RESEARCH PAPER

In-Hospital Outcome of Acute Coronary Syndrome in Patients with Diabetes Mellitus with and without chronic Kidney Disease

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Abstract

Background: Chronic kidney disease (CKD) and Diabetes Mellitus (DM) are highly prevalent, morbid diseases in every population. They are even more common among patients presenting with acute coronary syndromes (ACS).

Objective: The present study was, conducted to see the outcome of ACS patients with concurrent DM and CKD.

***Methods*:** The cohort study was carried out in the Department of Medicine, Dhaka Medical College & Hospital, Dhaka over a period six months from July 2017 to December 2017. All acute coronary syndrome patients having DM with or without CKD admitted in Medicine and Cardiology (CCU) Departments were the study population. ACS patients with concurrent DM with CKD formed the cohort group (n = 75) and DM without CKD were termed as control group (n = 75).

Result: The study was concluded that the ACS patients with concomitant CKD and DM (cohort) are usually older and more often hypertensive than the ACS patients with CKD alone (control) (63.9 vs. 55.9 years, $p < 0.001$ and 92% vs. 64%, $p < 0.001$ respectively). The typical chest pain is less commonly observed (68% vs. 86.7%, $p = 0.003$) and dyspnoea is more often present in this cohort than those in the control (92% vs. 52%, $p < 0.001$). NSTEMI is significantly present in the cohort compared that in the control group ($p < 0.001$). Serum Troponin I, CK-MB and eGFR were significantly higher in the former group than those in the latter group ($p = 0.044$, $p = 0.050$ and $p < 0.001$ respectively). Almost all the outcome parameters demonstrated their significance.

Conclusion: The diabetic with CKD (cohort group) is less likely to have ST elevations but is significantly prevalent having NSTEMI. Typical angina is less and dyspnea is more in cohort group.

Keywords: Acute Coronary Syndrome (ACS); Diabetes mellitus (DM); Chronic kidney disease (CKD)

Introduction

Chronic kidney disease (CKD) and diabetes mellitus (DM) are two rampantly prevalent and morbid condition in adult population that are even more common in the setting of acute coronary syndromes (ACS). Approximately 13.1% and 8.3% of the stable US adult population suffer from CKD and DM respectively[1,2] in which non-ST segment elevation MI (NSTEMI) may be present in up to 43% and 27% of cases respectively[3,4]. Both conditions are synergized with each other as well as with traditional risk factors. CAD remain the leading cause of morbidity and mortality in these populations. It is well known that coronary artery disease (CAD) is strongly associated with diabetes mellitus (DM) with progressively increasing CKD stages and patients were more likely to have hypertension, diabetes mellitus, MI, congestive heart failure, and stroke[5]. Moreover, the risk of mortality in ACS patients increases with the increase stages of CKD. Although outcomes were poor in patients of CKD with both types of MI[6], progressive CKD stage was associated with a steeper gradient of mortality among those presenting with STEMI and CKD compared with NSTEMI and CKD[5].

As CKD and DM are influencing the clinical symptoms, electrical findings and biomarker data are

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required for accurate diagnosis. Overlap is also substantial as many patients with CKD are also diabetic and vice versa. Prior manifestations of vascular disease including stroke or lower extremity peripheral arterial disease are also highly prevalent in the renal and diabetic populations[7]. Both CKD and DM are prothrombotic, inflammatory conditions resulting in high-risk atherothrombotic phenotypes.

Material and Methods

The present study was a prospective study. The study was carried out in the Department of Medicine, Dhaka Medical College & Hospital, Dhaka over a period six (6) months from July 2017 to December 2017 after acceptance of the protocol.

Study population: All acute coronary syndrome (ACS) patients having DM with or without CKD admitted in Medicine and Cardiology (CCU) Departments of Dhaka Medical College Hospital during the study period were the study population. In this study, ACS patients with concurrent DM with CKD formed the cohort group (n = 75) and DM without CKD were termed as control group (n = 75).

The study population fulfilled the following enrolment criteria.

Inclusion criteria*:* Patients with the following characteristics were included in the study: All acute coronary syndrome (STEMI, NSTEMI and UA) patients (18 years and onwards) having DM with or without CKD.

Exclusion criteria*:* Patients with the following criteria were excluded from the study:

1. Patients below 18 yrs of age
2. ACS associated with other co-morbid conditions (i.e. CLD, Malignancy, old MI, History of ACS with pregnancy etc.)
3. ACS patients along with structural heart disease (i.e. congenital heart disease, valvular heart disease, cardiomyopathy, etc.)
4. Patients having major psychiatric disorder.
5. Other physical condition (e.g. Beriberi) that can influence outcome.

Sampling Methods: Convenient and purposive sampling technique was employed to include the required number of patients. The study was intended to compare the in-hospital outcome of acute coronary syndrome patients having diabetic mellitus with and without chronic kidney disease. The patients presenting with symptoms consistent with acute coronary syndrome within 24 hours of hospital presentation plus characteristics ECG changes and/or known ACS and/or elevated serum cardiac biomarkers were included in the study. The patients were grouped into ACS having both diabetes mellitus & CKD and ACS having only diabetes mellitus without CKD after matching other confounding variables. The patients were considered diabetic if he/she had documented history of diabetes mellitus treated with diet or oral hypoglycemic agents or insulin or fasting plasma glucose level >7 mmol/L. CKD considered if he/she had documented history of CKD according to case definition. Demographic and other baseline clinical characteristics of the patients were recorded. Relevant investigations were done (if needed). All information was recorded in the data collection sheet. Outcome parameters observed in both groups during the hospital stay were in-hospital mortality, cardiogenic shock, congestive heart failure (CHF) or acute LVF, arrhythmia, recurrent angina and CVA.

Data were processed and analysed using computer software SPSS (Statistical Package for Social Sciences), version 16. The test statistics used to analyse the data were descriptive statistics, Chi-square (χ^2) or Fishers Exact Probability Test (for comparison of data presented on categorical scale) and Unpaired t-Test (for comparison of data presented on continuous scale). Level of significance was set at 5% and $p < 0.05$ was considered significant.

Results

The present is a study intended to compare the in-hospital outcomes of acute coronary syndrome patients, having diabetes mellitus and chronic kidney disease (cohort) with those having diabetes mellitus but no chronic kidney disease (control). The study included 75 cohorts and 75 controls. The findings obtained from data analyses are documented below:

Demographic and anthropometrics characteristics: The patients of cohort group were relatively older than that of control group with mean ages of the cohort and control groups were 63.9 and 55.9 years respectively ($p < 0.001$). Males were predominant in both groups with no significant intergroup difference ($p = 0.597$) (Table I).

Presenting complaints: Two-thirds (68%) of the cohort group and 86.7% of the control group patients presented with chest pain/discomfort; however, shortness of breath was significantly higher in the former group (92%) than that in the latter group (52%)

Table I: Comparison of demographic features between cohort and control groups

Demographic variables	Group		p-value
	Cohort(n = 75)	Control (n = 75)	
Age (yrs)#			
≤40	0(0.0)	9(12.0)	
40 – 50	12(16.0)	7(9.3)	
50 – 60	15(20.0)	38(50.7)	
>60	48(64.0)	21(28.0)	
Mean ± SD	63.9 ± 10.6	55.9 ± 11.4	<0.001
Sex*			
Male	50(66.7)	53(70.7)	0.597
Female	25(33.3)	22(29.3)	

Figures in the parentheses indicate corresponding %;
*Chi-squared Test (c^2) was done to analyze the data.
#Data was analyzed using Unpaired t-Test and were presented as mean ± SD.

(p< 0.001). A few patients of the case group (6.7%) had cardiac arrest as opposed to none in the control group (p = 0.023). Over two-thirds (68%) of the cohort group had NSTEMI compared to 34.7% of the control group (p < 0.001)(Table II).

*Presenting complaints:*Majority (92%) of the cohorts was hypertensive compared to 64% of the control group (p < 0.001). Smoking habit and family history of CAD were no different between the study groups (p = 0.410 and p = 0.393 respectively). Although a substantial proportion of both groups had dyslipidaemia, the prevalence was considerably higher in the cohort group than that of the control group (p = 0.055) (Table III).

*In-hospital outcome:*Almost all the outcome parameters (acute LVF, CHF, different types of arrhythmias, cardiogenic shock, sudden cardiac death, in-hospital mortality, recurrent angina) demonstrated their significant presence in the cohort group (p = 0.001, p < 0.001, p < 0.001, p < 0.001, p = 0.050, p = 0.050 and p < 0.001 respectively) (Table IV).

Table II: Comparison of presenting complaints between cohort and control groups

Presenting complaints*	Group		p-value
	Cohort(n = 75)	Control (n = 75)	
Chest pain/discomfort	51(68.0)	65(86.7)	0.003
Shortness of breath	69(92.0)	39(52.0)	<0.001
Cardiac arrest	5(6.7)	0(0.0)	0.023
Diagnosis (Type of ACS)			
STEMI	13(17.3)	28(37.3)	
NSTEMI	51(68.0)	26(34.7)	<0.001
UA	11(14.7)	21(28.0)	

Figures in the parentheses indicate corresponding %;
*Chi-squared Test (c^2) was done to analyzed the data.

Table III: Comparison of risk factors between cohort and control groups

Risk factors*	Group		p-value
	Cohort(n = 75)	Control (n = 75)	
Hypertension	69(92.0)	48(64.0)	<0.001
Smoking	35(46.7)	30(40.0)	0.410
Family history of CAD	29(38.7)	24(32.0)	0.393
Dyslipidemia	69(92.0)	61(81.3)	0.055

Figures in the parentheses indicate corresponding %;
*Chi-squared Test (c^2) was done to analyzed the data.

Discussion

The present study demonstrated that ACS patients with concomitant CKD and DM were generally older and more often hypertensive than their control counterparts. Consistent with these findings studies have shown that patients with CKD/DM tend to be older, more often female and hypertensive compared to their non-DM counterparts[3,4]. Although hypertension was found to be significantly associated with ACS patients having concomitant DM and CKD, other traditional atherosclerotic risk factors like smoking, dyslipidaemia and family history of coronary artery diseases bear insignificant association with this cohort. These findings are almost consistent with findings of other similar studies which showed that ACS patients with CKD have a weaker association with the "traditional atherosclerotic risk factors, such as low-density lipoprotein cholesterol, tobacco use, and family history of CAD[8,9]. In the present study typical chest pain was less commonly observed in the diabetic and CKD cohort compared to their control group (ACS with CKD only), while dyspnoea was more frequent in the former group than the latter group. NSTEMI demonstrated their significant presence in the diabetic and CKD cohort compared to the control group. The classical or typical chest pain (substernal chest pain radiating to the left arm) is significantly less common among ACS patients with CKD or DM. Sosnov and colleagues[10](2006) in a study rather demonstrated that symptoms of dyspnoea were more often associated with CKD (odds ratio (95% CI): 1.73, 1.40 – 2.15), while chest pain was much less common (0.48, 0.41- 0.57). Patients with CKD and ACS are more likely to present with heart failure symptoms[11,12] as happened in the present study (58.7% of the cohort group had congestive heart failure as against 22.6%). Similar findings have been observed by others in the setting of DM[13,14]. In the present study the overall outcome was worse in the diabetic and CKD cohort as opposed to their control counterparts. The discreet outcome variables like demonstrated their significant presence in the cohort group. Diabetic patients always demonstrated a worse outcome compared with their nondiabetic counterparts. The reasons for the increased risk include co-morbidities like renal impairment or heart failure. So in the present study where the cohort group was formed of ACS patients with concurrent diabetes and CKD, the staggeringly higher incidences of adverse outcomes stand to reason. Another reason of worse outcome in the ACS patients with CKD or DM lies in the fact that optimal management of this high-risk cohort is further complicated by more advanced presentation. This argument is fortified by the CRUSADE registry, where signs of congestive heart failure (CHF) were significantly more common among UA patients with CKD than those without CKD (43.7% vs. 19.8%, $p < 0.001$)[15]. Not surprisingly, CKD was also significantly associated with higher incidence of in hospital cardiogenic shock (OR1.37, 95% CI: 1.16-1.61)[16]. Studies have also shown that patients with advanced CKD are (as estimated by eGFR) more likely to have worse in-hospital outcome. For example an analysis of 14,527 patients with AMI revealed that patients with estimated glomerular filtration rate (eGFR) less than 81 mL/min/1.73m^2 had an increased hazard ratio for death and nonfatal cardiovascular outcomes (OR = 1.10, 95% CI = 1.08-1.12) for every 10 mL/min decline in eGFR[17]. The USRDS databank further strengthens this finding: the 2-year survival of Medicare enrollees after AMI drops from 57% in those without CKD to 38% in patients with CKD with an overall trend favoring worse outcomes with worse kidney disease: 47% survival for stages 1 to 2 CKD vs. 30% survival for stages 4 to 5 CKD. ACS patients with CKD or DM are at markedly increased risk for adverse events, even when managed with contemporary pharmacotherapy and treatment strategies. Improving post-ACS outcomes in these patients represents an important clinical and public health imperative given the high prevalence and substantial health care expenditures attributable to either condition. While post-hoc analyses of major trials and registries have provided critical insight, dedicated studies evaluating ACS treatments and outcomes in these specific patient populations are long overdue and suggested. New therapies in the management of ACS have been developed over the last few decades with the blessings of large-scale trials.

Conclusion

From the findings of the study, it can be demonstrated that the ACS patients with concomitant CKD and DM are usually older and more often hypertensive than the ACS patients with CKD alone. The typical chest pain is less commonly observed and dyspnoea is more often present in cohort group. NSTEMI is significantly present in DM with CKD compared with DM and non CKD group. The diabetic and CKD patients are less likely to have ST elevations, pathologic Q waves, ST

segments depression or new onset of left bundle branch block on the electrocardiogram but this group has more likely to present with heart failure symptoms.

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Ethical Clearance: The study protocol was ethically reviewed and approved by The Ethical Review Committee of Dhaka Medical College. Institutional clearance was obtained from the Hospital Director of Dhaka Medical College Hospital. Permission was also taken from concerned departments where study would be undertaken.

Conflict of Interest: There was no conflict of interest.

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