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RESEARCH ARTICLE

ASSOCIATION OF RENAL DYSFUNCTION WITH CARDIOVASCULAR OUTCOMES AMONG PATIENTS WITH ACUTE MYOCARDIAL INFARCTION IN A SELECTED TERTIARY CARE HOSPITAL

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ABSTRACT

Introduction: Chronic kidney disease is a major global health problem and it is an important risk factor for cardiovascular disease and adverse outcomes. Measurement of eGFR on admission could be reliably used in the risk stratification of patients with AMI and control of eGFR leads to reduction in short term outcomes of patients with AMI. **Aim:** To assess the association of renal dysfunction with cardiovascular outcomes among patients with acute myocardial infarction.**Methodology:** A prospective observational study was conducted on 100 patients admitted in hero DMC heart institute (HDHI) Ludhiana by convenience sampling. Socio demographic profile, clinical profile, renal dysfunction by MDRD GFR equation (Levey 2006) and self structured tool to assess cardiovascular outcomes was used to collect data. Data was collected from patient records, bio-physiological measures and by interview method.**Results:** 100 patients were observed for 30 days/or till discharge. Out of 100 patients 34% of the subjects had normal kidney function (>90 ml/min/1.73 m^2), followed by 29% had mild CKD (60-89 ml/min/1.73m^2), 26% had moderate CKD (30-59 ml/min/1.73 m^2), 7% had severe CKD (15-29 ml/min/1.73 m^2) and 4% had end stage kidney disease (<15 ml/min/1.73 m2) as per MDRD GFR equation with mean GFR ± SD was 73.23±33.54 ml/min/1.73 m^2. 1% of the subject had atrial fibrillation with mild CKD, followed by 3% had with moderate CKD and 1% had with severe CKD. 3% of the subjects had ventricular tachycardia with normal kidney function, followed by 1% had with mild CKD, 4% had with moderate CKD and 1% had with severe CKD. 2% of the subjects had cardiogenic shock with normal kidney function, followed by 3% had with mild CKD,4% had with moderate CKD,1% had with end stage renal failure. 1% of the subject had cardiac arrest with mild CKD, followed by 3% had with moderate CKD, 1% had with severe CKD. 1% of the subject had death with CVD with mild CKD, followed by 4% had with moderate CKD, 1% had with severe CKD. 1% of the subject readmitted within 30 days of observation. Mean days ± SD was 9.34 ± 5.29. There was significant association of readmission (p=.009) and length of hospital stay (p= .038) with renal dysfunction.**Conclusion:** The present study concluded that most of the patients with AMI had renal dysfunction. Renal dysfunction was significantly associated with readmission and length of hospital stay in cardiovascular outcomes. Although, no significant association was found between atrial fibrillation, ventricular tachycardia, cardiogenic shock, cardiac arrest and death with CVD among cardiovascular outcomes with renal dysfunction but these cardiovascular outcomes were recorded among patients with AMI.

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INTRODUCTION

Chronic kidney disease is a major global health problem and it is an important risk factor for cardiovascular disease and adverse outcomes. The heart and kidney are important for cardiovascular (CV) homeostasis. Cardiac activity provides blood and oxygen to all or any the organs of the body, whereas the kidney plays a key role within the maintenance of fluid, electrolyte and acid–base equilibrium, in hemoglobin synthesis also as within the clearance of metabolic waste products. However, once either falls ill, the opposite organ frequently suffers also. Myocardial infarction may be a term applied to myocardial necrosis secondary to an acute interruption of the coronary blood supply. Modifiable risk factors include Diabetes mellitus, smoking, hypertension, hyperlipidemia, sedentary life style, obesity, stress and depression. CKD is defined by the presence of

Unfortunately, chronic kidney disease is under diagnosed and undertreated, resulting in lost opportunities for prevention. More than 50 percent of deaths among patients with end-stage renal disease are due to cardiovascular events Compared to patients with preserved kidney function, those with chronic kidney disease are more likely to have longer hospital stays and more likely to have developed important clinical complications including atrial fibrillation, cardiogenic shock, and heart failure during hospitalization. In-hospital and 30-day death rates are significantly higher among patients with chronic kidney disease compared to patients with preserved renal function Measurement of eGFR on admission could be reliably used in the risk stratification of patients with AMI and control of eGFR leads to reduction in short term outcomes of patients with AMI.

METHODS

A prospective observational study was conducted on 100 patients with AMI admitted in Hero DMC Heart Institute (HDHI) Ludhiana, Punjab by convenience sampling technique. The tool included socio demographic profile, clinical profile, renal dysfunction by MDRD GFR equation (Levey 2006) and self structured tool to assess cardiovascular outcomes to collect data. Data was collected from patient records, bio-physiological measures and by interview methods.

Inclusion and exclusion criteria: Acute MI patients with age ≥18 years, ST-elevation MI (STEMI) and non-ST elevation MI (NSTEMI), willing to participate in the study were included in the study. Acute MI patients with concominantvalvular disease, neoplastic or infectious connective tissue, inflammatory diseases were excluded from the study.

Study population/participants: The target population was patients with acute myocardial infarction those were admitted in Hero DMC Heart Institute, Ludhiana, Punjab. The sample size was 100 patients with acute MI patients admitted in Hero DMC Heart Institute, Ludhiana, Punjab.

Data collection and processing: The tool included socio demographic profile, clinical profile, renal dysfunction by MDRD GFR equation (Levey 2006) and self structured tool to assess cardiovascular outcomes to collect data. Data was collected from patient records, bio-physiological measures and by interview methods.

Statistical analysis and result analysis: The collected data were analysed according to the objectives of the study. Descriptive (frequency and percentage distribution, mean and standard deviation) and inferential statistics (chi-square) was used to analyse and interpret the primary data. Calculation was done using Microsoft excel and Statistical Package for Social Sciences (SPSS) 17.0. The analysis and interpretation of data obtained from 100 patients with acute myocardial infarction admitted in department of cardiology unit Hero DMC Heart Institute (HDHI) in selected tertiary care hospital of district Ludhiana, Punjab in order to assess the association of renal dysfunction with cardiovascular outcomes among patients with acute myocardial infarction.

Ethical guidelines: The institutional review board of the hospital approved the study for ethical issues. Written informed consent wasobtained from the subjects or from their next of kin

SECTION – I

Table 1. Distribution of patients with acute myocardial infarction as per their socio-demographic variables

N=100

Socio-demographic variables	(f%)
Age (in years)(#)	
21-40	07
41-60	44
61-80	48
81-100	01
Gender	
Male	76
Female	24
Marital status	
Married	100

Distribution of patients as per socio-demographic profile: As per age, majority i.e. 48% of the acute myocardial infarction patients were in the age group of 61-80 years with mean age ± SD: 59.5 ± 11.81 years, followed by 44% in 41-60 years, 7% in 21-40 years and only 1% in 81-100 years of age group. As per gender, more than half (76%) of the subjects were males whereas 24% were females. As per marital status, all (100%) of the subjects were married.

SECTION – II

Table 2. Distribution of patients with acute myocardial infarction as per their Anthropometric measurements

N= 100

Anthropometric measurement	Value	(f%)	Mean± SD
BMI(kg/M^2)			
Normal	18.5-24.9	49	Male 26.11±3.41
Overweight	25-29.9	40	Female-24.59±3.70
Obese	30-30.9	8	
Extremely obese	>35	3	
Waist circumference(cm)			Male-109.26±9.68
Low	70-89 cm	15	Female-93.58±9.69
High	90-109 cm	47	
Very high	>110cm	38	
Waist- hip Ratio			
Low	<0.80-0.95	46	Male-0.95±0.02
Moderate	0.96-1.0	52	Female-0.90±0.08
High	>1.0	2	

Distribution of patients as per clinical profile: Table 2 depicts the distribution of patients with acute myocardial infarction as per their anthropometric measurements. Less than half (49%) of the acute myocardial infarction patients had normal BMI, followed by 40% were overweight, 8% were obese and 3% were extremely obese. The mean BMI ± SD of male was found to be 26.11±3.41 followed by the mean BMI ± SD of female was found to be 24.59±3.70. According to the waist circumference, majority i.e. 47% of the patients with acute myocardial infarction had high waist circumference, followed by 38% had very high waist circumference, and 15% had low waist circumference. The Mean waist circumference ± SD of male was 109.26±9.68 followed by mean waist circumference ± SD of female was 93.58±9.69. As per waist hip ratio, majority (52%) of the patients with acute myocardial infarction had moderate Waist- Hip Ratio, followed by 46% had low Waist-Hip Ratio and 2% had the high Waist-Hip Ratio. The mean Waist- Hip Ratio ± SD of male was found to be 0.95±0.02 followed by mean Waist-Hip Ratio ± SD of female was found to be 0.90±0.08. Therefore, it was concluded that majority of the subjects had normal BMI, high waist circumference and the moderate waist hip ratio.

Table 3. Distribution of patients with acute myocardial infarction as per their clinical profile

N=100

Clinical profile	(f%)
Comorbidities (#)	
Diabetic	51
Hypertension	64
Dyslipidemia	01
CAD	18
Asthma	12
Arthritis	06
Hypothyroidism	03
Post liver transplant	01
BPH	01
Family history of coronary artery disease	
Yes	27
No	73
Killip classification of Acute M.I. (*)	
Class I	15
Class II	66
Class III	11
Class IV	08
Left ventricle ejection fraction (LVEF)(**)	
11-20%	06
21-30%	35
31-40%	43
41-50%	12
51-60%	04

*# Multiple comorbidities **Mean LVEF ± SD= 34.46 ± 8.74%*

Table 3 explain the distribution of patients with acute myocardial infarction as per their clinical profile. As per comorbidities, multiple comorbidities were noted. More than half i.e. 51% of the subjects with acute myocardial infarction had diabetes, followed by 64% had hypertension, 1% had the dyslipidemia,18% had CAD, 12% had asthma, 6% had arthritis, 3% had hypothyroidism, 1% had post liver transplant and only 1% had benign prostate hypertrophy. As per family history of coronary artery disease, more than half i.e.73% of the patients with acute myocardial infarction did not have any family history of coronary artery disease whereas 27% of the subjects had family history of coronary artery disease. As per Killip Classification of AMI, majority i.e. 66% of the patients with acute myocardial infarction were in the Killip Class II, followed by 15% were in the Killip Class I, 11% were in the Killip Class III and 8% were in the Killip Class IV. As per left ventricle ejection fraction (LVEF), majority i.e.43% of patients with acute myocardial infarction had left ventricle ejection fraction (LVEF)within 31-40%, followed by 35% had LVEF within 21-30%, 12% had LVEF within 41-50%, 6% had LVEF within 11-20% and 4% had the LVEF within 51-60%. The mean LVEF % ± SD was *34.46± 8.74.* Thus, it concluded that majority of the subjects had multiple comorbidities, less family history of coronary artery disease, majority were in the killip class II and majority of the subject's LVEF was within the range of 31-40%.

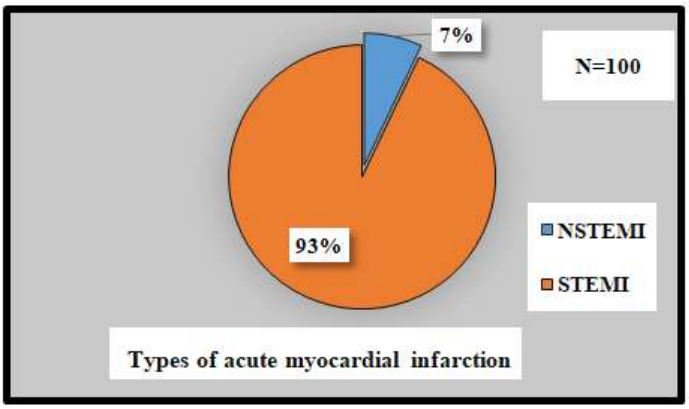


Figure 1. Distribution of patients with acute myocardial infarction as per the types of myocardial infarction

Figure 1 depicts the distribution of patients with acute myocardial infarction as per the types of myocardial infarction, in which majority i.e.93% had STEMI (ST elevation MI) and 7% had NSTEMI (non ST elevation MI).

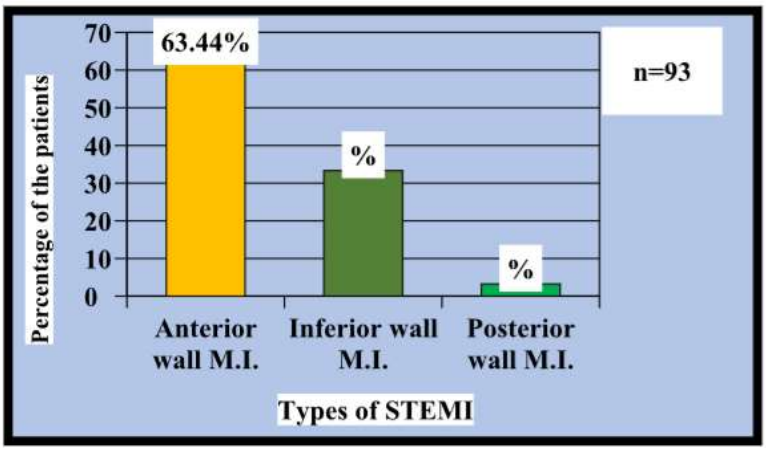
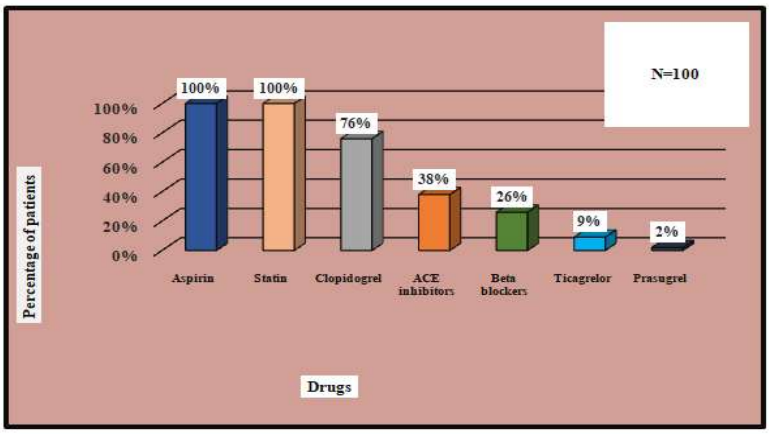


Figure 2. Distribution of patients with acute myocardial infarction as per the types of STEMI

Figure 2 depicts the distribution of patients with acute myocardial infarction as per the types of STEMI, in which more than half i.e. 59(63.44%) of the subjects had anterior wall myocardial infarction (AWMI), 31(33.33%) of the subjects had inferior wall myocardial infarction (IWMI) and 3(3.23%) of the subjects had posterior wall myocardial infarction (PWMI). Thus, it concluded that majority of the subjects had STEMI and among STEMI patients, majority had anterior wall M.I.



 # Multiple drugs prescription

Figure 3. Distribution of patients with acute myocardial infarction as per the Pharmacotherapy

Figure 3 depicts the distribution of patients with acute myocardial infarction as per the Pharmacotherapy, in which multiple drugs were prescribed. Among them, all i.e. 100% of the subjects were prescribed with aspirin and statins, followed by 76% were taking clopidogrel, 38% were ordered ACE inhibitors, 26% were taking beta blockers, 9% were advised ticagrelor and 2% were prescribed prasugrel. Hence, it concludes that all the subjects were prescribed with aspirin and statin. clopidogrel, ACE inhibitors, beta blockers, ticagrelor and prasugrel were also prescribed.

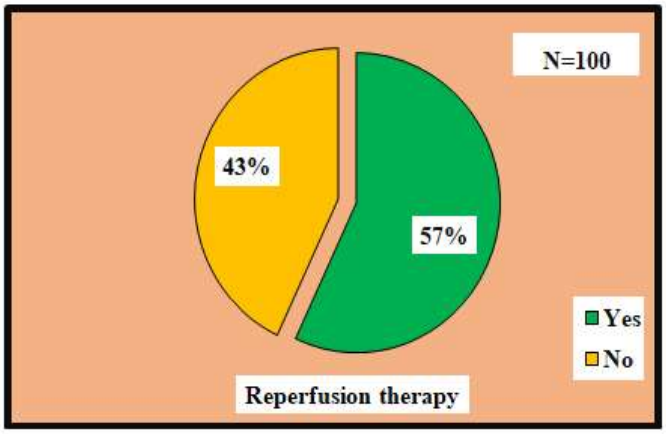
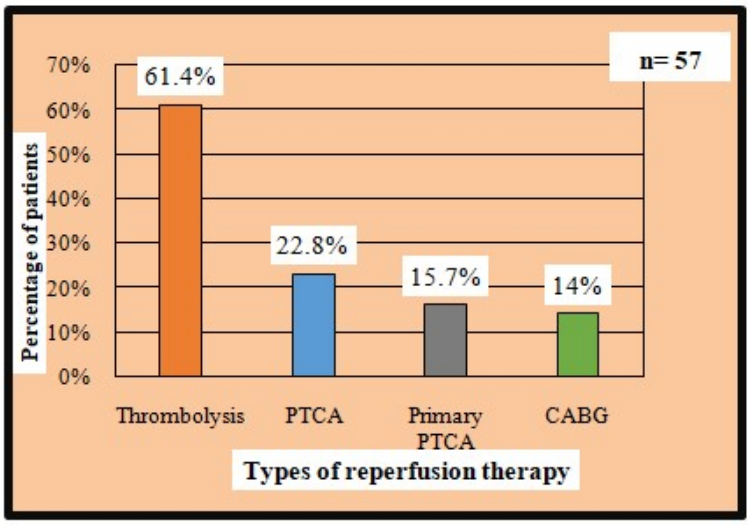


Figure 4 depicts the distribution of patients with acute myocardial infarction as per their reperfusion therapy, in which more than half i.e.57% of the subjects had reperfusion therapy for the management of acute myocardial infarction whereas 43% of the subjects did not receive reperfusion therapy.



 # Multiple reperfusion therapy

Figure 5. Distribution of patients with acute myocardial infarction as per types of Reperfusion therapy.

Figure 5 depicts the distribution of patients with acute myocardial infarction as per types of Reperfusion therapy, in which multiple reperfusion therapy was prescribed. Among 57 patients, 35(61.4%) of the subjects had thrombolysis, 13(22.8%) had PTCA, 9(15.7%) had primary PTCA and 8(14%) had CABG. Therefore, it concluded that majority of the subjects were treated with reperfusion therapy such as thrombolysis, PTCA, primary PTCA and CABG.

Table 4. Distribution of patients with acute Myocardial infarction as per their laboratory values

N=100

Laboratory values	(f%)	Mean ± SD
WBC Normal (4.5 to 11×10^3/dl) Low (<4.5×10^3/dl) High (>11×10^3/dl)	 51 02 47	11.37±5.66
RBC Normal (4.5 to 5.5×10^6/dl) Low (<4.5×10^6/dl) High (>5.5×10^6/dl)	 47 40 13	4.50±0.94
Hb Normal (12-17 gm/dl) Low (<12gm/dl) High (>17gm/dl)	 73 27 0	13.08±2.47
Creatinine Normal (0.7-1.2 mg/dl) Low (<0.7 mg/dl) High (>1.2 mg/dl)	 53 06 41	1.46±1.25
Urea Normal (10-50 mg/dl) Low (<10mg/dl) High(>50 mg/dl)	 65 0 35	50.65±33.42
Total cholesterol(#)(n=96) Normal (50-200 mg/dl) Low (<50 mg/dl) High (>200 mg/dl)	 75 0 21	156.85±57.75
Troponin- T (*)(n= 76) Normal (0.0-0.03ng/mL) Low (<0.0ng/ml) High (>0.03 ng/ml)	 08 0 68	1.43±2.48
CK-MB (n= 65)(~) Normal (0.0-4.3ng/ml) Low (<0.0ng/ml) High (>4.3 ng/ml)	 23 0 42	73.23±33.54

 # Cholesterol was not ordered for 4 patients. Troponin –T was; not ordered for 24 patients~ CK-MB was not ordered for 35 patients*

Table 4 exhibits the distribution of patients with acute myocardial infarction as per their laboratory values. As per laboratory values, more than half i.e.51% of the subjects had normal WBC value within the range of (4.5 to 11×10^3/dl), followed by 2% had WBC value (<4.5×10^3/dl) and 47% had WBC value (>11×10^3/dl). The mean WBC ± SD of the subjects was 11.37±5.66. As per RBC, majority i.e.47% of the subjects had normal RBC value within the range of (4.5 to 5.5×10^6/dl), followed by 40% had RBC value (<4.5×10^6/dl) and 13% had RBC value (>5.5×10^6/dl)

The mean RBC± SD was 4.50±0.94. As per Hb, majority i.e.73% of the subjects had normal Hb value within the range of (12-17 gm/dl) and 27% had Hb value (<12gm/dl). The mean Hb± SDwas 13.08±2.47. As per creatinine, more than half i.e. 53% of the subjects had normal creatinine value within the range of (0.7-1.2 mg/dl), followed by 6% had creatinine value (<0.7 mg/dl) and 41% had creatinine value (>1.2 mg/dl).The mean creatinine ± SD was 1.46±1.25. As per urea, majority i.e. 65% of the subjects had normal urea value within the range of (10-50 mg/dl) whereas 35% had urea value (>50 mg/dl). The mean urea value± SD was 50.65±33.42. As per cholesterol, majority i.e. 75% of the subjects had normal total cholesterol value (50-200 mg/dl) whereas 21% had total cholesterol value (>200 mg/dl). The mean Cholesterol ± SDwas 156.85±57.75. Cholesterol was not ordered for the 4 patients. As per Troponin - T, only 8% of the subjects had normal Troponin- T value within the range of (0.0-0.03ng/mL) whereas majority i.e. 68% had Troponin- T value (>0.03 ng/ml). The mean Troponin- T ± SDwas 1.43±2.48. Troponin –T was not ordered for the 24 patients. As per CK-MB, about 23% of the subjects had normal CK-MB value within the range of (0.0-4.3ng/ml) whereas 42% had CK-MB value (>4.3 ng/ml). The mean CK-MB ± SDwas 73.23±33.54.CK-MB was not ordered for the 35 patients. Therefore, it was concluded that majority of the subjects had normal WBC count, normal RBC count, normal Hb, normal creatinine, normal urea, normal total cholesterol, high troponin –T and high CK-MB values.

SECTION –III

Objective 1.To assess renal dysfunction and cardiovascular outcomes among patients with acute myocardial infarction

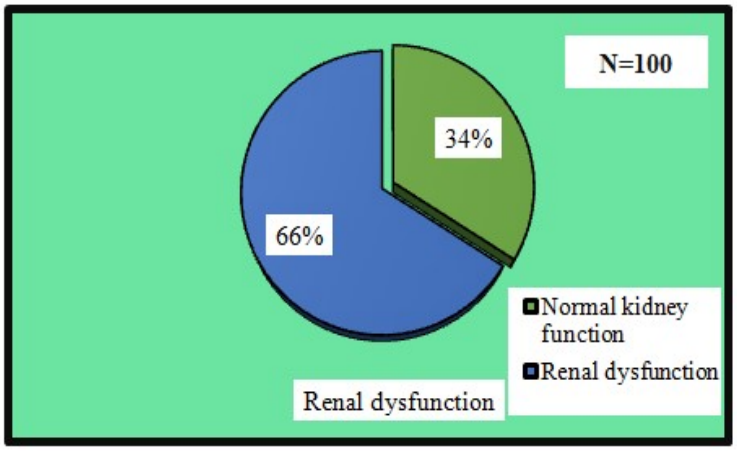


Figure 6. Distribution of patients with acute myocardial infarction as per renal dysfunction as assessed by MDRD GFR equation

Figure 6depicts the distribution of patients with acute myocardial infarction as per renal dysfunction as assessed by MDRD GFR equation, in which more than half i.e. 66% of the subjects had renal dysfunction whereas 34% had normal kidney function.

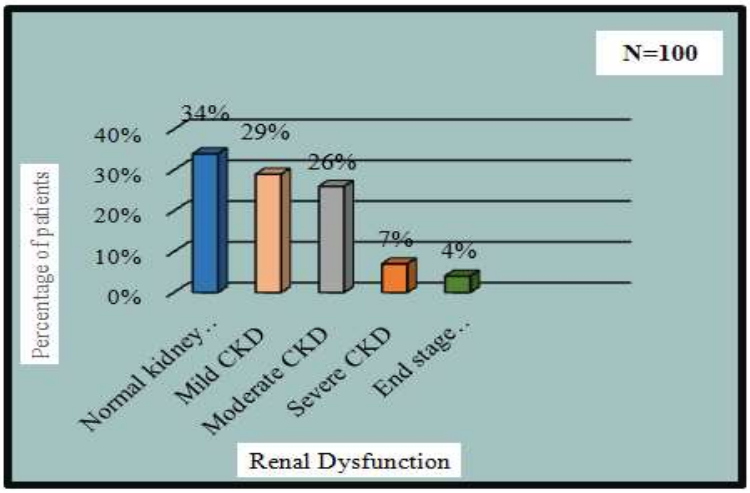


Figure 7. Distribution of patients with acute myocardial infarction as per categories of renal dysfunction as assessed by MDRD GFR equation

Figure 7, exhibit the distribution of patients with acute myocardial infarction as per categories of renal dysfunction as assessed by MDRD GFR equation. Out of 100% of the subjects, less than half i.e. 34% had normal kidney function with mean GFR ± SD: 110.62 ± 14.97, followed by 29% had mild CKD with mean GFR± SD:74.24 ± 8.51.

One fourth of the subjects i.e.26% had moderate CKD with mean GFR ± SD: 46.68 ± 8.41 whereas 7% had severe CKD with mean GFR ± SD: 22.45 ± 4.34 and only 4% had end stage kidney disease with mean GFR ± SD: 9.75 ± 1.84. Thus, it concludes that out of 100 patients, 66% of the subjects had renal dysfunction with various categories ranging from mild to end stage kidney disease.

Distribution of subjects as per the cardiovascular outcomes

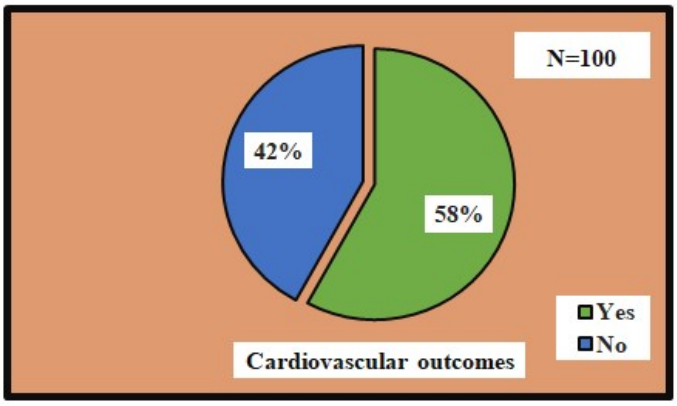
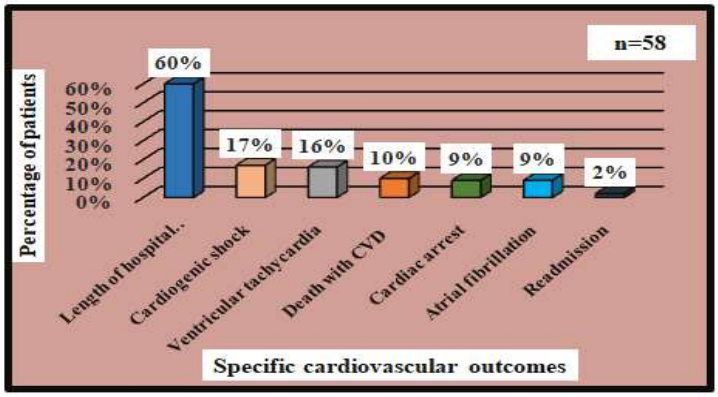


Figure 8. Distribution of patients with acute myocardial infarction as per their cardiovascular outcomes

Figure 8, depicts the distribution of patients with acute myocardial infarction as per their cardiovascular outcomes. Out of 100 patients, 58% of the subjects had adverse cardiovascular outcomes whereas 42% did not had any adverse cardiovascular outcomes.



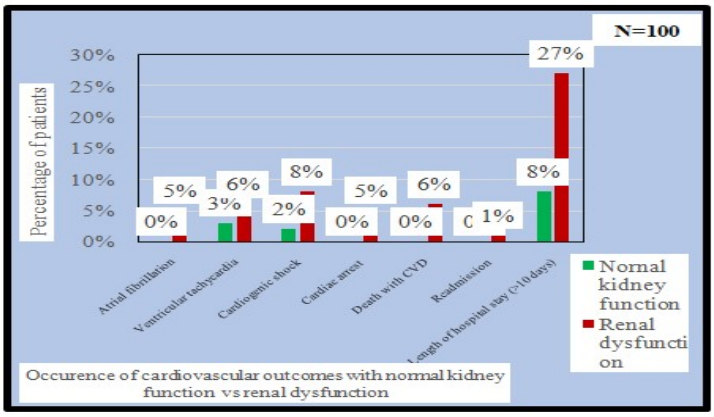
*# Multiple specific cardiovascular outcomes *Mean days± SD= 9.34 ± 5.29*

Figure 9: Distribution of patients with acute myocardial infarction as per their specific cardiovascular outcomes

Figure 9 depicts distribution of patients with acute myocardial infarction as per their specific cardiovascular outcomes, among the 58 subjects, multiple adverse cardiovascular outcomes were recorded. Majority i.e. 35(60%) of the subject's length of hospital stay was >10 days, followed by 10(17%) had cardiogenic shock, 9(16%) had ventricular tachycardia, 6(10%) had death with CVD, 5(9%) had cardiac arrest and atrial fibrillation respectively and only 1(2%) readmitted within 30 days of hospital stay. The mean days of length of hospital stay ± SD was *9.34 ± 5.29.*

Section: IV

Objective 2. To find out the association of renal dysfunction with cardiovascular outcomes among patients with acute myocardial infarction



 # Multiple cardiovascular outcomes

Figure 10. Distribution of patients with acute myocardial infarction as per the occurrence of cardiovascular outcomes with normal

Figure 10 depicts the distribution of patients with acute myocardial infarction as per the occurrence of multiple adverse cardiovascular outcomes with normal kidney function vs chronic kidney disease (CKD). Out of 100 patients, 5% of the subjects had atrial fibrillation with CKD whereas no occurrence seen with normal kidney function, followed by 6% had ventricular tachycardia with CKD whereas 3% had ventricular tachycardia with normal kidney function, 8% had cardiogenic shock with CKD whereas only 2% had cardiogenic shock with normal kidney function, 5% had cardiac arrest with CKD whereas no cardiac arrest was recorded with normal kidney function,6 % had death with CVD with CKD whereas no death with CVD was recorded with normal kidney function, only 1% readmitted within 30 days of hospital stay with CKD whereas no readmission was noted with normal kidney disease and 27% had the length of hospital stay >10 days with CKD whereas 8% had length of hospital stay >10 days with normal kidney function.

Table 5. Association between renal dysfunction (MDRD GFR equation) and cardiovascular outcomes

N=100

Renal dysfunction	Atrial fibrillation (AF)		Ventricular tachycardia (VT)		Cardiogenic shock		Cardiac arrest		Death with CVD		Readmission with same diagnosis		Length of hospital stay	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	1-10	> 10
Normal kidney function (>90ml/min/1.73 m^2)	0	34	03	31	02	32	0	34	0	34	0	34	26	08
Mild CKD (60-89 ml/min/1.73 m^2)	01	28	01	28	03	26	01	28	01	28	0	29	18	11
Moderate CKD (30-59 ml/min/1.73 m^2)	03	23	04	22	04	22	03	23	04	22	0	26	14	12
Severe CKD (15-29 ml/min/1.73 m^2)	01	06	01	06	0	07	01	06	01	06	01	06	06	01
End stage kidney disease (<15ml/min/1.73 m^2)	0	04	0	04	01	03	0	04	0	04	0	04	01	03
x^2 statistics	5.758 df = 4 p = 0.218 NS		3.021 df = 4 p = 0.554 NS		3.260 df = 4 p = 0.515 NS		5.758 df = 4 p = 0.218 NS		7.672 df = 4 p = 0.104 NS		13.420 df = 4 p = 0.009*		16.293 df = 4 p = 0.038*	

**significant p < 0.05 level NS (Non-significant) p >0.05*

Table 5 explains the association between renal dysfunction (MDRD GFR equation) and cardiovascular outcomes. Out of 5% subjects with AF outcome from the 100 patients, 1% had AF with mild CKD (60-89 ml/min/1.73 m^2), 3% had AF with moderate CKD (30-59 ml/min/1.73 m^2) and 1% had AF with severe CKD (15-29 ml/min/1.73 m^2). Among the 9% subjects with VT outcome, 3% had VT with normal kidney function (>90ml/min/1.73 m^2), 1% had VT with mild CKD (60-89 ml/min/1.73 m^2), 4% had VT with moderate CKD (30-59 ml/min/1.73 m^2) and 1% had VT with severe CKD (15-29 ml/min/1.73 m^2). Out of 10% subjects with cardiogenic shock outcome, 2% had cardiogenic shock with normal kidney function (>90ml/min/1.73 m^2), 3% had cardiogenic shock with mild CKD (60-89 ml/min/1.73 m^2), 4% had cardiogenic with moderate CKD (30-59 ml/min/1.73 m^2) and 1% had cardiogenic shock with end stage CKD (<15ml/min/1.73 m^2). Among the 5% subjects with cardiac arrest outcome, 1% had cardiac arrest with mild CKD (60-89 ml/min/1.73 m^2), 3% had cardiac arrest with moderate CKD (30-59 ml/min/1.73 m^2) and 1% had cardiac arrest with severe CKD (15-29 ml/min/1.73 m^2). Among the 6% subjects with death in CVD outcome, 1% had death with CVD in mild CKD (60-89 ml/min/1.73 m^2), 4% had death with CVD in moderate CKD (30-59 ml/min/1.73 m^2) and 1% had death with CVD in severe CKD (15-29 ml/min/1.73 m^2). Out of 100% subjects, only 1% readmitted within 30 days of hospital stay. Among the 35% subjects with length of hospital stay outcome, 8% had length of hospital stay >10days with normal kidney function (>90ml/min/1.73 m^2), 11% had length of hospital stay >10 days with mild CKD (60-89 ml/min/1.73 m^2), 12% had length of hospital stay >10 days with moderate CKD (30-59 ml/min/1.73 m^2), 1% had length of hospital stay >10 days with severe CKD (15-29 ml/min/1.73 m^2) and 3% had length of hospital stay >10 days with end stage kidney disease (<15ml/min/1.73 m^2). Renal dysfunction is significantly associated with cardiovascular outcomes like readmission (p=0.009) and length of hospital stay (p=0.038) and no association was found in atrial fibrillation (p = 0.218), ventricular tachycardia (p=0.554), cardiogenic shock (p=0.515), cardiac arrest (p=0.218) and death with CVD (p =0.104) with renal dysfunction among patients with acute myocardial infarction. Thus it concludes that renal dysfunction is significantly associated with readmission and length of hospital stay. Although, no significant association was found between atrial fibrillation, ventricular tachycardia, cardiogenic shock, cardiac arrest and death with CVD with renal dysfunction but these cardiovascular outcomes were recorded among patients with AMI.

DISCUSSION

Section I and II: ***Socio demographic and Clinical profile of patients with acute myocardial infarction:*** The present study showed that out of 100 patients, 48% were found in the age group of 61-80 years with mean age ± SD was 59.5 ± 11.81 yrs, more than half of the patient i.e.76% were male. The mean BMI ± SD was 26.11±3.41 kg/m^2. Majority i.e. 64% had hypertension, 51% had diabetes, 15.7% had primary PTCA (percutaneous transluminal coronary angioplasty) and 43% were current smokers. Mean creatinine of subjects was 1.46±1.25 and mean MDRD eGFR ± SD was 73.23 ± 33.54 ml/min/1.73 m^2. Similar study was conducted by Paul A. Santolucito et al. (2010), observational study on population consisted of 6,219 residents of the Worcester (MA) metropolitan area hospitalized with acute myocardial infarction in 6 annual periods between 1995 and 2005. The average age of patients was 71 years and 56% were men[21].

Objective: To assess renal dysfunction and cardiovascular outcomes among patients with acute myocardial infarction.

Section-III: Renal dysfunction and cardiovascular outcomes among patients with acute myocardial infarction

Renal dysfunction: The present study showed that 66% of the subject had renal dysfunction. Out of 100 patients, 34% had the normal kidney function (>90 ml/min/1.73 m^2), followed by 29% had mild CKD (60-89 ml/min/1.73m^2), 26% had moderate CKD (30-59 ml/min/1.73 m^2), 7% had severe CKD (15-29 ml/min/1.73 m^2), 4% had end stage kidney disease (<15 ml/min/1.73 m^2). Similar study was conducted by Mark A. Navarro, (2008), 3617 AMI patients included in the study, 3041 (84%) did not have CKD (eGFR ≥60 mL/min), 459 (13%) had stage 3 CKD (eGFR 30–59 mL/min), 72 (2%) had stage 4 CKD (eGFR 15–29 mL/min), and 45 (1%) had stage 5 CKD (eGFR<15 mL/min or dialysis)[23].

Cardiovascular outcomes: Present study showed that out of 100 patients of acute myocardial infarction, 5(9%) of the subjects had atrial fibrillation. Similar study was conducted by Yan Dai, Jingang Yang (2017), on atrial fibrillation in patients hospitalized with acute myocardial infarction: analysis of the China Acute Myocardial Infarction (CAMI) registry on 24,658 patients diagnosed with AMI were enrolled in CAMI registry from January 2013 to September 2014.In the CAMI registry, 740 (3%) patients were recorded with AF prevalence during hospitalization[38].

Objective: To find out the association of renal dysfunction with cardiovascular outcomes among patients with acute myocardial infarction.

Section IV: Association between renal dysfunction (MDRD GFR equation) and cardiovascular outcomes

Present study reveals multiple cardiovascular outcomes, Out of 10% subjects with cardiogenic shock outcome, 2% had cardiogenic shock with normal kidney function (>90ml/min/1.73 m^2), 3% had cardiogenic shock with mild CKD (60-89 ml/min/1.73 m^2), 4% had cardiogenic with moderate CKD (30-59 ml/min/1.73 m^2) and 1% had cardiogenic shock with end stage CKD (<15ml/min/1.73 m^2). Among the 6% subjects with death in CVD outcome, 1% had death with CVD in mild CKD (60-89 ml/min/1.73 m^2), 4% had death with CVD in moderate CKD (30-59 ml/min/1.73 m^2) and 1% had death with CVD in severe CKD (15-29 ml/min/1.73 m^2). Out of 5% subjects with AF outcome from the 100 patients, 1% had AF with mild CKD (60-89 ml/min/1.73 m^2), 3% had AF with moderate CKD (30-59 ml/min/1.73 m^2) and 1% had AF with severe CKD (15-29 ml/min/1.73 m^2). Length of hospital stay, mean days ± SD was 9.34 ± 5.29. There was significant association of cardiovascular outcomes like readmission (p=0.009) and length of hospital stay (p=0.038) with renal dysfunction and no association was found in atrial fibrillation (p = 0.218), ventricular tachycardia (p=0.554), cardiogenic shock (p=0.515), cardiac arrest (p=0.218), death with CVD (p =0.104) with renal dysfunction among patients with acute myocardial infarction. Similar study was conducted by Caroline S. Fox (2009), 59970 subjects was drawn from the Acute Coronary Treatment and Intervention Outcomes Network (ACTION) Registry–Get With the Guidelines (GWTG), a nationwide sample of myocardial infarction patients admitted to 383 hospitals in the United States between July 2008 and September 2009. 253(6.6%) deaths were seen in mild AKI patients, 467(14.2%) deaths in moderate AKI, 731(31.8%) deaths was seen in severe AKI. 257(6.7%) cardiogenic shock was seen in mild AKI, 417(12.7%)cardiogenic shock in moderate AKI, 518(22.5%) cardiogenic shock was seen in severe AKI[39]. Similar study Paul A. Santolucito, et al. (2010), conducted a study observational study on population consisted of 6,219 residents of the Worcester (MA) metropolitan area hospitalized with acute myocardial infarction in 6 annual periods between 1995 and 2005. 23.8% patient had AF with severe CKD (≤30 ml/min/1.73 m^2), 22.1% had AF with mild to moderate CKD (31–59 ml/min/1.73 m^2) and 13.9% had AF with preserved kidney function (≥60 ml/min/1.73 m^2), 9.7% patient had cardiogenic shock with severe CKD(≤30 ml/min/1.73 m^2), 8% had cardiogenic shock with mild to moderate CKD (31–59 ml/min/1.73 m^2) and 4.1% had cardiogenic shock with preserved kidney function (≥60 ml/min/1.73 m^2), 24.7% had death with severe CKD (≤30 ml/min/1.73 m^2), 14.7% had death with mild to moderate CKD (31–59 ml/min/1.73 m^2), 4.9% had death preserved kidney function (≥60 ml/min/1.73 m^2)[21].

CONCLUSION

The present study concluded that most of the patients with AMI had renal dysfunction. Renal dysfunction was significantly associated with readmission and length of hospital stay with cardiovascular outcomes. Cardiovascular outcomes such as atrial fibrillation, ventricular tachycardia, cardiogenic shock, cardiac arrest and death with CVD were recorded among patients with AMI having categories of renal dysfunction although, no significant association was found between these.

Limitation

- The present study was conducted in only one selected tertiary care hospital Ludhiana, Punjab.
- Generalization of the study results cannot be done due to small sample size.
- Sample was drawn by non-probability sampling technique which restricts the generalization of results.

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