International Journal of Research in Medical Sciences
Hossen M et al. Int J Res Med Sci. 2024 Dec;12(12):4460-4465
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20243691

Original Research Article

Cardiovascular risk and acute coronary syndrome management in chronic kidney disease patients: a prospective observation study

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Received: 13 October 2024
Revised: 12 November 2024
Accepted: 16 November 2024

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ABSTRACT

Background: Chronic kidney disease (CKD) significantly elevates the risk of coronary artery disease (CAD) due to both traditional and uraemia-related risk factors, leading to accelerated atherosclerosis and increased cardiovascular events. This study aims to evaluate the clinical and therapeutic characteristics of CKD patients with ACS, assess CKD's impact on ACS severity and outcomes and identify effective management strategies for this high-risk group.
Methods: This prospective study included 104 ACS patients admitted across various medical centers in Cumilla, Bangladesh between June 2023 and June 2024. Data were collected on demographics, clinical history, diagnostics and therapeutic interventions, with rigorous ethical considerations and informed consent. Statistical analysis was conducted using descriptive statistics to explore the clinical and therapeutic characteristics of ACS in patients with CKD.
Results: The study examined a diverse patient group with an average age of 34.2 years, predominantly male (55.8%). Smoking was reported by 26.9%, with hypertension (38.5%) and diabetes (28.8%) being common. LVEF was normal in 50%, mildly reduced in 25% and moderately reduced in 25%. Chest pain was the most common symptom (26.9%). ACS patients with chronic kidney disease had higher complication rates, including reinfarction (27.9%), cerebrovascular events (21.2%) and an in-hospital mortality rate of 14.4%, underscoring the severity of their cardiovascular risks.
Conclusions: In conclusion, chronic kidney disease (CKD) markedly amplifies the risk of coronary artery disease (CAD) by combining traditional cardiovascular risk factors with those related to uraemia, resulting in heightened morbidity and mortality.

Keywords: Acute coronary syndrome, chronic kidney disease, Coronary artery disease, Uremia

INTRODUCTION

Patients with chronic kidney disease (CKD) have a comparable risk of coronary artery disease (CAD) as those with established risk factors. The combination of traditional cardiovascular risk factors and uraemia-related risk factors accelerates atherosclerosis, leading to an increased risk of significant adverse cardiac events.[1,2] The prevalence of chronic kidney disease (CKD) and coronary artery disease (CAD) is increasing worldwide.[3,4] Uremia is an independent cardiovascular risk factor that contributes to hyperfibrinogenemia, hyperhomocystinemia, hyperfibrinogenemia and lipoprotein(a) abnormalities in addition to traditional cardiovascular risk factors. These

conditions accelerate the atherosclerotic process in patients with chronic kidney disease (CKD).[5] Uremia, a hallmark of advanced CKD, is an independent cardiovascular risk factor. It is associated with a range of metabolic disturbances, including hyperfibrinogenemia, hyperhomocystinemia and abnormalities in lipoprotein(a) levels, all of which contribute to the accelerated atherosclerotic process observed in CKD patients.[6,7]

These disturbances exacerbate the inflammatory and prothrombotic state, further increasing the likelihood of cardiovascular events.[8] Moreover, CKD patients frequently present with additional comorbidities, such as anemia, fluid overload and electrolyte imbalances, which further complicate their cardiovascular risk profile.[9]

Recent studies have highlighted the alarming increase in cardiovascular morbidity and mortality among CKD patients, emphasizing the need for early detection and management of cardiovascular risk factors in this population.[10,11] The interplay between CKD and CAD creates a vicious cycle, where the progression of one condition accelerates the deterioration of the other, leading to poorer outcomes.[12]

Furthermore, the management of CAD in CKD patients is often complicated by the altered pharmacokinetics of cardiovascular drugs and the increased risk of adverse drug reactions, necessitating a more cautious and individualized approach to treatment.[13]

The growing recognition of the cardiovascular burden in CKD patients has led to the development of specialized guidelines and risk stratification tools aimed at improving the management of cardiovascular disease in this high-risk population.[14] However, despite these advances, significant gaps remain in the optimal management of CKD-related cardiovascular risk, highlighting the need for ongoing research and improved clinical practices.[15]

Primary objective

To evaluate the clinical and therapeutic characteristics of patients with chronic kidney disease (CKD) presenting with acute coronary syndrome (ACS).

Secondary objective

To assess the impact of CKD on the severity and outcomes of ACS. To identify effective management strategies for CKD patients with CAD, focusing on treatment challenges, clinical practices and risk stratification.

METHODS

Study design

A comprehensive prospective observational study was carried out, involving a total of 104 patients who were admitted with a confirmed diagnosis of acute coronary syndrome (ACS).

Study place

The study was conducted across multiple private medical centers located in Cumilla, Bangladesh.

Study duration

The patient recruitment spanned a full year, from June 2023 to June 2024, allowing for a thorough examination of ACS in this population.

The study aimed to gather detailed data on the clinical presentations, management strategies and outcomes associated with ACS in these patients, providing valuable insights into the regional variations and challenges in treating this condition.

Inclusion criteria

Patients were included if they demonstrated new evidence of myocardial ischemia on electrocardiography (ECG), which could be accompanied by angina or dyspnoea. Inclusion also required the presence of elevated myocardial necrosis enzymes, such as high-sensitivity troponins (hs-cTn), regardless of whether there was an elevation. Additionally, patients with normal or decreased glomerular filtration rate (GFR) were considered eligible for the study.

Exclusion criteria

Patients were excluded if they had previous ECG changes indicative of myocardial ischemia without new signs of acute coronary disease. Other exclusion factors included myocardial injury with nonspecific elevation of cardiac necrosis enzymes due to conditions like sepsis, advanced heart failure, chronic kidney disease or a history of cerebrovascular accidents.

Data collection procedure

We used demographic information, clinical histories and presenting symptoms were documented. Diagnostic evaluations, including laboratory tests and imaging studies, were performed to confirm ACS and assess CKD severity. Therapeutic interventions, in-hospital management and any complications were meticulously recorded throughout the patients' hospital stays. Data were captured using a standardized collection form, ensuring consistency and accuracy.

This comprehensive dataset was then analyzed to explore the clinical and therapeutic characteristics of ACS in patients with CKD, providing valuable insights into patient outcomes. ACS was defined as a patient presenting with positive cardiac troponin and one of the following: Chest discomfort with or without persistent ST-segment

elevation (ECG alters that). This may include transient ST-segment elevation, whether sustained or transient Symptoms may include ST-segment depression, T-wave inversion, flat or pseudo-normalized T waves or normal ECG. Imaging may also be required. Evidence of genuine myocardial loss or new regional wall motion. anomaly in the pattern associated with an ischaemic aetiology.

Statical analysis

Data were collected using a pre-designed pro forma and managed in Microsoft Excel and SPSS-16. Quantitative data were presented as mean ± standard deviation, while qualitative data were summarized as frequencies and percentages. Categorical variables were analyzed using Chi-square tests and continuous variables were assessed with unpaired t-tests.

Ethical consideration

Ethical guidelines for this study were strictly followed to safeguard the rights and welfare of all participants. Conducted across multiple medical centers in Cumilla, Bangladesh, the study ensured that informed consent was acquired from each patient, who were fully briefed on the study's objectives, methods, potential risks and benefits. Participation was voluntary, with patients free to withdraw at any time without impacting their medical treatment. Confidentiality was upheld through the use of anonymized data and secure storage, accessible exclusively to authorized research staff.

RESULTS

Table 1 presents the demographic and clinical characteristics of the 104 patients included in the study. The age distribution reveals that the majority of patients are in the 31-40 age group (31.7%), followed by 41-50 (26.0%), 51-60 (24.0%), 61-70 (14.4%) and only a small portion are aged≥71 years (3.8%). The mean age of the patients is 34.2 years with a standard deviation of 8.3 years.

Gender distribution is slightly skewed towards males, who make up 55.8% of the study population, while females account for 44.2%. The mean BMI of the patients is 23.18 with a standard deviation of 2.07. In terms of occupation, service holders constitute the largest group (26.9%), followed by businessmen (23.1%), housewives (21.2%), farmers (19.2%) and others (9.6%).

Figure 1 shows the distribution of smoking status among the 104 patients in the study. Out of the total population, 28 patients (26.9%) reported being smokers, while the majority, 76 patients (73.1%), indicated that they do not smoke.

Table 2 provides an overview of the clinical profile of the 104 patients involved in the study. The data reveal that 38.5% of patients were diagnosed with hypertension, while the remaining 61.5% were not. Regarding the general diagnosis, a significant majority of 67.3% of patients were diagnosed with a clinical condition, whereas 32.7% were not. In terms of diabetes prevalence, 28.8% of the patients had diabetes, while the majority, 71.2%, did not.

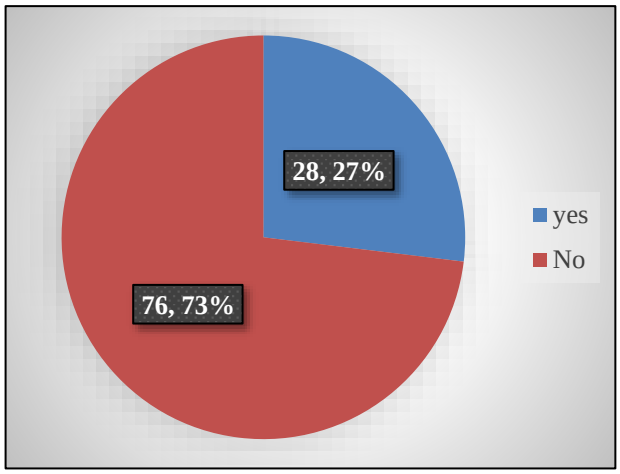

Figure 1: Smoking status among the patients.

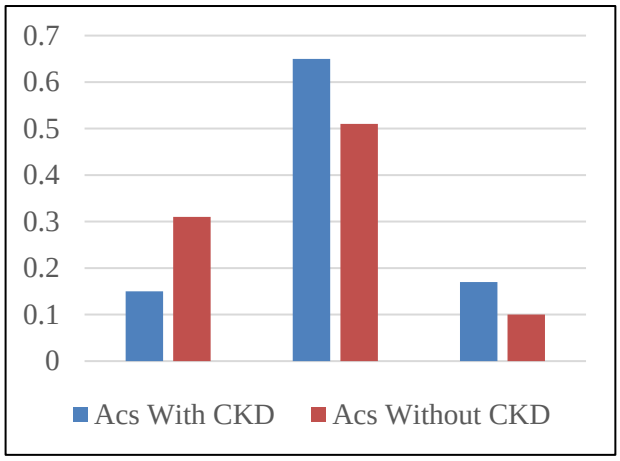

Figure 2: Acute coronary syndrome (ACS) with and without chronic kidney disease (CKD).

Table 3 presents the distribution of left ventricular ejection fraction (LVEF) and chronic kidney disease (CKD) stages among the 104 patients in the study. For LVEF, half of the patients (50.0%) have a normal ejection fraction, while 25.0% exhibit mild reduction and another 25.0% have moderate reduction in LVEF. In terms of CKD stages, the largest group of patients is in Stage 3 CKD, representing 38.5% of the population. Stage 4 CKD is present in 34.6% of the patients and Stage 5 CKD is found in 26.9% of the patients.

Table 4 outlines the distribution of presenting symptoms among the 104 patients in the study. Chest pain was the most common symptom, reported by 26.9% of the patients. This was followed by vomiting, which affected 21.2% of the population and breathlessness, reported by

19.2%. Diaphoresis and abdominal pain were present in 15.4% and 17.3% of patients, respectively. Figure 2 shows the distribution of patients with Acute Coronary Syndrome (ACS) with and without chronic kidney disease (CKD) across three categories. In the first category, the proportion of ACS patients with CKD is 0.15, while those without CKD have a higher proportion of 0.31.

In the second category, ACS patients with CKD exhibit a significantly higher proportion of 0.65 compared to 0.51 for those without CKD. In the third category, the proportion of ACS patients with CKD is 0.17, slightly higher than the 0.1 observed for those without CKD.

Table 1: Demographic and clinical characteristics of the study population (n=104).

Characteristics	Frequency	%
Age distribution (years)		
31-40	33	31.7
41-50	27	26.0
51-60	25	24.0
61-70	15	14.4
≥71	4	3.8
Mean±SD	34.2±8.3	
Gender		
Male	58	55.8
Female	46	44.2
BMI (Body mass index)	23.18±2.07	
Occupation		
Service holder	28	26.9
Businessman	24	23.1
Farmer	20	19.2
Housewife	22	21.2
Others	10	9.6

Table 2: Clinical profile of the study population (n=104).

Category	Frequency	%
Hypertension		
Yes	40	38.5
No	64	61.5
Diagnosis		
Yes	70	67.3
No	34	32.7
Diabetes		
Yes	30	28.8
No	74	71.2

Table 5 shows the in-hospital complications experienced by the 104 patients in the study. Reinfarction was the most common complication, affecting 27.9% of the patients, followed by cerebrovascular accidents (CVA), which occurred in 21.2% of cases.

Ventilator support was required by 19.2% of the patients and heart block requiring temporary pacemaker implantation (TPI) was observed in 17.3%. Unfortunately, 14.4% of the patients succumbed to their conditions during hospitalization.

Table 3: Left ventricular ejection fraction (LVEF) and chronic kidney disease (CKD) stages in the study population (n=104).

Characteristics	Frequency	%
Left ventricular ejection fraction (LVEF)		
Normal	52	50.0
Mild	26	25.0
Moderate	26	25.0
Chronic kidney disease (CKD)		
Stage 3	40	38.5
Stage 4	36	34.6
Stage 5	28	26.9

Table 4: Distribution of presenting symptoms (n=104).

Presenting complaint	Frequency	%
Diaphoresis	16	15.4
Chest pain	28	26.9
Vomiting	22	21.2
Breathlessness	20	19.2
Abdominal pain	18	17.3

Table 5: In-hospital complications in the study population (n=104).

Complications	Frequency	%
Ventilator support	20	19.2
Heart block requiring TPI	18	17.3
Death	15	14.4
Cerebrovascular accident (CVA)	22	21.2
Reinfarction	29	27.9

DISCUSSION

Both CAD and CKD are serious health issues. As people get older, it occurs more frequently.[16] There are likely more patients with CAD and CKD as a result of the rise in patients with diseases including diabetes, hypertension, longer life expectancies and advancements in health care management.[17]

The age distribution reveals that the majority of patients are in the 31-40 age group (31.7%), followed by 41-50 (26.0%), 51-60 (24.0%), 61-70 (14.4%) and only a small portion are aged ≥71 years (3.8%). In terms of gender, males were slightly more prevalent, constituting 55.8% of the study population, while females accounted for 44.2%. Other study shows, the world showed comparable findings about male dominance. The age range was 35–88 years old, with a mean of 61.4±13.[18]

Also in our study shows, Out of the total population, 28 patients (26.9%) reported being smokers, while the majority, 76 patients (73.1%), indicated that they do not smoke. Our findings are also very much consistent with data in a study where calculated smoking 24.8%.[19] In our study shows, 38.5% of patients were diagnosed with hypertension, while the remaining 61.5% were not. Regarding the general diagnosis, a significant majority of 67.3% of patients were diagnosed with a clinical condition, whereas 32.7% were not.

Other study shows, diabetes and hypertension were common occurring in 49 (72.1%) and 57 (83.8%) of all CKD patient respectively which is similar to various similar studies.[20,21] In our study shows, LVEF, half of the patients (50.0%) have a normal ejection fraction, while 25.0% exhibit mild reduction and another 25.0% have moderate reduction in LVEF.

Also in our study shows, the proportion of ACS patients with CKD is 0.15, while those without CKD have a higher proportion of 0.31. In the second category, ACS patients with CKD exhibit a significantly higher proportion of 0.65 compared to 0.51 for those without CKD. In the third category, the proportion of ACS patients with CKD is 0.17.

Also, in our study shows, the most common complication, affecting 27.9% of the patients, followed by cerebrovascular accidents (CVA), which occurred in 21.2% of cases. Ventilator support was required by 19.2% of the patients and heart block requiring temporary pacemaker implantation (TPI) was observed in 17.3%. Other study shows, the death rate reported was 6.7% and a single centre study.[22]

Study has few limitations like the study was conducted at a single centre, had a small sample size and was completed quickly. Angiographic lesions were not categorised and the patients' medical treatments were not examined

CONCLUSION

In conclusion, chronic kidney disease (CKD) significantly exacerbates the risk of coronary artery disease (CAD) through a combination of traditional and uraemia-related cardiovascular risk factors, leading to increased morbidity and mortality. The complex interplay between CKD and CAD necessitates early detection, individualized management and continued research to optimize cardiovascular care in this high-risk population

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Hossen M, Khan EK, Haq MN, Islam MS, Pervin S. Cardiovascular risk and acute coronary syndrome management in chronic kidney disease patients: a prospective observation study. Int J Res Med Sci 2024;12:4460-5.