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ORIGINAL ARTICLE

Impact of Chronic Kidney Disease on Outcomes of Patients with Gastrointestinal Bleeding and Concomitant Cardiovascular Disease: A Multicentred Prospective Study

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ABSTRACT

Background: Chronic kidney disease (CKD) is a prevalent systemic disorder that increases the risk of bleeding and adverse cardiovascular outcomes.

Objective: To evaluate the impact of CKD on outcomes in patients presenting with gastrointestinal bleeding and concomitant cardiovascular disease.

Methodology: This was a cross-sectional multicenter study conducted at Sahiwal Teaching Hospital, Sahiwal from March 2023 to August 2023, included 185 patients admitted with gastrointestinal bleeding and established cardiovascular disease. Patients were categorized into two groups: those with CKD (n = 95) and those with normal renal function (n = 90). Data on demographics, comorbidities, laboratory findings, transfusion requirements, rebleeding rates, hospital stay, and mortality were recorded.

Results: The mean age of the study population was 61.8 ± 10.7 years, with a male predominance (60.5%). CKD patients had significantly lower hemoglobin levels (8.3 ± 2.0 g/dL vs. 9.6 ± 2.4 g/dL, p = 0.001) and higher rates of hypertension, diabetes, and ischemic heart disease. Rebleeding occurred in 22.1% of CKD patients compared to 7.8% of non-CKD patients (p = 0.007). Blood transfusions were required in 69.5% versus 43.3%, respectively (p < 0.001). The mean hospital stay was longer in CKD patients (8.2 ± 3.6 vs. 5.7 ± 2.8 days, p < 0.001), and mortality was significantly higher (13.7% vs. 5.6%, p = 0.04). Multivariate analysis revealed that CKD (OR: 2.61, 95% CI: 1.11–6.15), low hemoglobin (OR: 1.83, 95% CI: 1.02–3.64), and diabetes mellitus (OR: 1.97, 95% CI: 1.05–3.98) were independent predictors of mortality.

Conclusion: CKD significantly worsens the prognosis of patients with gastrointestinal bleeding and cardiovascular disease. These patients experience higher mortality, rebleeding rates, and transfusion needs, along with prolonged hospitalization.

Keywords: CKD, gastrointestinal bleeding, cardiovascular disease, mortality, rebleeding, transfusion, renal impairment

INTRODUCTION

Chronic Kidney Disease (CKD) is one of the most significant global health burdens, affecting millions of people worldwide and steadily increasing in prevalence due to the rising incidence of diabetes, hypertension, and aging populations[1]. Kidney function and structure decline over time, which leads to buildup of toxins and other problems, issues. Chronic Kidney Disease goes beyond the decline of decline renal functions. This condition has effects on the whole body including the heart, blood, and metabolic systems, leading to higher morbidity and mortality than the general population[2]. Gastrointestinal bleeding (GIB) is one of the many issues of concern and is especially common with those suffering from chronic illness[3]. CKD patients tend to develop bleeding issues and this can, include disorders in the platelets which can be due to unbalanced toxins, and changes in the lining of the blood vessels[4]. Patients suffering from chronic illness with high blood pressure and diabetes (which is common), have a higher chance of suffering from a GIB and this can be exacerbated by the use of blood thinning medication[5]. Changes and bleeding of the lining of the abdomen and bowels can be more common. Cardiovascular disease (CVD) is the other common and leading cause of death. Obesity is one of the greatest of chronic illness[6]. The need for antithrombotic therapy in patients with ischemic heart disease, atrial fibrillation, or prior heart and vascular surgeries carries with it an additional risk for developing a bleeding disorder, and particularly in the area of the gastrointestinal tract[7]. Thus, the coexistence of chronic kidney disease (CKD) and cardiovascular disease (CVD) greatly increases the risk for gastrointestinal bleeding. There are significant difficulties in the management of patients with both CVD and CKD that present with gastrointestinal bleeding[8]. These patients often present with the dual problems of needing to maintain hemostasis while providing cardiovascular protection. On one hand, to gain control of bleeding, the clinician may need to withhold anticoagulant and antithrombotic medications[9]. This, however, can lead to a higher risk of thromboembolic complications and ischemic exacerbations in the heart. On the other hand, the clinician may opt to withhold medications that increase the risk of further bleeding[10]. In these very finely balanced clinical situations, the small hemodynamic changes that can occur are especially dangerous. CKD often is accompanied by a triad of mechanisms that further complicate the situation including a lack of compensatory mechanisms, the presence of anemia, and a reduced ability to maintain a functioning cardiac reserve[11]. Moreover, the pathophysiological consequences of blood loss are often amplified in patients with renal impairment. The reduced production of erythropoietin in conjunction with pre-existing anemia decreases the potential delivery of oxygen to tissues, increasing the likelihood of cardiovascular complications during acute bleeds[12]. The need for fluid resuscitation, a mainstay of GIB management, is especially complicated in these patients by the need to avoid fluid overload in patients with heart failure or fluid retention[13]. In situations of fluid resuscitation, CKD makes the pharmacokinetics and pharmacodynamics of medications even more complicated. Medications that include Protons, Anticoagulants, and Antibiotics must be managed adequately, particularly in dosing, to prevent in toxicity and/or failure in therapeutics[14].

Objective: To evaluate the impact of CKD on outcomes in patients presenting with gastrointestinal bleeding and concomitant cardiovascular disease.

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METHODOLOGY

This was a cross-sectional multicenter study conducted at Sahiwal Teaching Hospital, Sahiwal from March 2023 to August 2023. A total of 185 patients were included in the study. Non-probability consecutive sampling was employed. All eligible patients presenting during the study period who met the inclusion criteria were enrolled after obtaining informed consent.

Inclusion Criteria:

1. Adult patients aged 18 years or older.
2. Confirmed diagnosis of gastrointestinal bleeding (hematemesis, melena, or hematochezia).
3. Documented history of cardiovascular disease, including ischemic heart disease, heart failure, arrhythmia, or prior cardiovascular intervention.
4. Availability of laboratory or clinical parameters to classify renal function.

Exclusion Criteria:

1. Patients with known bleeding disorders or thrombocytopenia unrelated to CKD.
2. Patients on chronic anticoagulation for non-cardiovascular indications (e.g., deep vein thrombosis without CVD).
3. Individuals with hepatic failure or portal hypertension–related variceal bleeding.
4. Patients who declined participation or had incomplete medical records.

Data Collection: After ethical approval from the institutional review board, data were collected using a structured proforma. A comprehensive clinical assessment including the taking of history, performing of examinations, and conducting appropriate investigations were conducted for each patient. Baseline information including demographic information, comorbidity, medication history, and laboratory parameters were recorded. These included hemoglobin, renal profile, electrolytes, and coagulation profile. Staging of CKD used estimated glomerular filtration rate (eGFR) calculated using the CKD-EPI formula. Patients were assigned to one of two groups: with CKD (eGFR < 60 mL/min/1.73 m²) and with normal renal function. All patients were provided standard management for gastrointestinal bleeding according to institution protocol which included, fluid resuscitation, blood transfusion, endoscopic therapy, and corresponding cardiovascular support. Primary outcomes were death, rebleeding, and blood transfusion during the stay in the hospital. Secondary outcomes included length of stay in the hospital, requirement for admission to the hospital- based intensive care unit, and decrease in renal function during hospitalization. The effect of CKD on these outcomes was compared between CKD and non-CKD groups.

Statistical Analysis: All collected data were entered into SPSS version 21.0 for analysis. Quantitative variables such as age, hemoglobin, creatinine, and hospital stay were presented as mean ± standard deviation and compared using the independent-sample t-test or Mann–Whitney U test based on data distribution. Qualitative variables including gender, presence of comorbidities, rebleeding, and mortality were expressed as frequencies and percentages and analyzed using the chi-square or Fisher's exact test. Normality of continuous data was assessed using the Shapiro–Wilk test. A p-value < 0.05 was considered statistically significant.

RESULTS

Data were collected from 185 patients, mean age of the study population was 61.8 ± 10.7 years, with a slight male predominance (60.5%). Patients with CKD were significantly older (63.9 ± 9.4 years) than those without CKD (59.5 ± 11.3 years, p = 0.014). The prevalence of hypertension and diabetes was notably higher among CKD patients (77.9% and 66.3%, respectively) compared with non-CKD patients (62.2% and 51.1%), both reaching statistical significance. Similarly, ischemic heart disease was more common in the CKD group (61.1%) than in the non-CKD group (43.3%, p = 0.01). CKD patients also exhibited significantly lower hemoglobin levels (8.3 ± 2.0 g/dL) and higher serum creatinine (3.3 ± 1.1 mg/dL) compared with those without renal impairment (9.6 ± 2.4 g/dL and 0.9 ± 0.3 mg/dL, respectively).

Table 1: Baseline Demographic and Clinical Characteristics of Patients (n = 185)

Variable	Total (n = 185)	CKD Group (n = 95)	Non-CKD Group (n = 90)	p-value
Age (years), mean ± SD	61.8 ± 10.7	63.9 ± 9.4	59.5 ± 11.3	0.014
Male gender, n (%)	112 (60.5%)	57 (60.0%)	55 (61.1%)	0.88
Hypertension, n (%)	130 (70.3%)	74 (77.9%)	56 (62.2%)	0.02
Diabetes mellitus, n (%)	109 (58.9%)	63 (66.3%)	46 (51.1%)	0.03
Ischemic heart disease, n (%)	97 (52.4%)	58 (61.1%)	39 (43.3%)	0.01
Hemoglobin (g/dL), mean ± SD	8.9 ± 2.3	8.3 ± 2.0	9.6 ± 2.4	0.001
Serum creatinine (mg/dL), mean ± SD	2.1 ± 1.4	3.3 ± 1.1	0.9 ± 0.3	<0.001
Systolic BP (mmHg), mean ± SD	128.4 ± 18.2	126.9 ± 17.5	130.0 ± 18.8	0.29

Table 2: Comparison of Clinical Outcomes Between CKD and Non-CKD Groups (n = 185)

Outcome	CKD Group (n = 95)	Non-CKD Group (n = 90)	p-value
Rebleeding, n (%)	21 (22.1%)	7 (7.8%)	0.007
Blood transfusion required, n (%)	66 (69.5%)	39 (43.3%)	<0.001
Mean units transfused ± SD	2.8 ± 1.3	1.7 ± 1.0	<0.001
ICU admission, n (%)	25 (26.3%)	12 (13.3%)	0.03
Acute kidney injury, n (%)	27 (28.4%)	5 (5.6%)	<0.001
Hospital stay (days), mean ± SD	8.2 ± 3.6	5.7 ± 2.8	<0.001
In-hospital mortality, n (%)	13 (13.7%)	5 (5.6%)	0.04

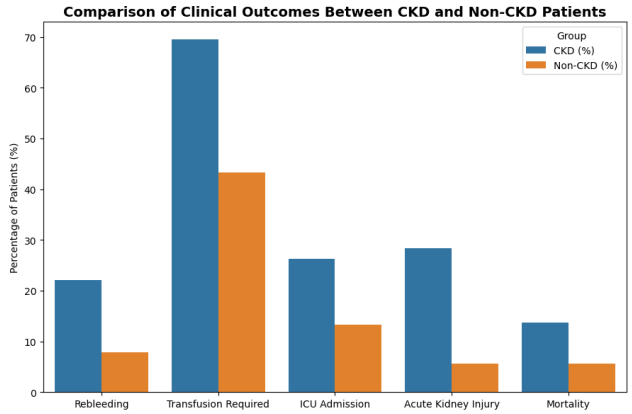
Table 3: Multivariate Logistic Regression Analysis for Predictors of In-Hospital Mortality

Variable	Adjusted Odds Ratio (95% CI)	p-value
Chronic kidney disease	2.61 (1.11–6.15)	0.028
Low hemoglobin (<9 g/dL)	1.83 (1.02–3.64)	0.041
Diabetes mellitus	1.97 (1.05–3.98)	0.049
Age > 65 years	1.42 (0.73–2.76)	0.30
Male gender	1.09 (0.55–2.14)	0.79

Rebleeding occurred in 22.1% of CKD patients compared with only 7.8% in the non-CKD group (p = 0.007). Blood transfusions were required more frequently among CKD patients (69.5%) than non-CKD patients (43.3%), with a higher mean number of units transfused (2.8 ± 1.3 vs. 1.7 ± 1.0, p < 0.001). Intensive care admission was also more common in the CKD group (26.3% vs. 13.3%, p = 0.03). Acute kidney injury occurred in 28.4% of CKD patients compared with 5.6% of those without CKD (p < 0.001), demonstrating a strong association between preexisting renal dysfunction and further renal deterioration during hospitalization. The mean length of hospital stay was significantly longer for CKD patients (8.2 ± 3.6 days vs. 5.7 ± 2.8 days, p < 0.001), and the in-hospital mortality rate was more than twice as high (13.7% vs. 5.6%, p = 0.04).

After adjusting for age, gender, and comorbidities, CKD remained an independent predictor of mortality, increasing the odds of death by approximately 2.6 times (OR 2.61, 95% CI 1.11–

6.15, p = 0.028). Low hemoglobin levels (<9 g/dL) were also significantly associated with increased mortality risk (OR 1.83, 95% CI 1.02–3.64, p = 0.041), reflecting the detrimental effect of anemia on clinical outcomes. Diabetes mellitus independently predicted higher mortality as well (OR 1.97, 95% CI 1.05–3.98, p = 0.049).



DISCUSSION

The present study evaluated the impact of chronic kidney disease (CKD) on clinical outcomes in patients presenting with gastrointestinal bleeding (GIB) and concomitant cardiovascular disease (CVD). Out of the 185 patients included in the analysis, almost half were found to have CKD, and were found to have worse outcomes in comparison to those who did not have CKD. The results demonstrate that in this vulnerable cohort, CKD was a potent and independent predictor of mortality, rebleeding, the need for transfusions, prolonged length of stay, and the development of AKI. The results of this study corroborate those of previous studies which showed that CKD was associated with significant deterioration in the clinical course of patients with gastrointestinal bleeding. Patients with renal failure often have a bleeding diathesis as a result of altered platelet function, poor aggregation, and vascular uremic changes. Furthermore, patients with CKD have a greater burden of comorbid diseases, more medications and this increases the risk of adverse events even more. Similar to what is described in this study, other clinical cohorts have shown that the presence of CKD was associated with higher rates of rebleeding, increased need for transfusions, and greater mortality. The authors of those studies also noted the strong association of CKD with poor outcomes, which can be explained by various interrelated mechanisms[15]. Defective vascular integrity, which is endothelial dysfunction, is associated with a reduction in platelet aggregation and adhesion. The anemia that is often a problem with advanced CKD also causes a reduction in oxygen available to tissues for recovery after they have hemorrhaged, and it results in a lack of adequate tissue perfusion after hemorrhagic events. This is a significant problem as it results in the development of more advanced vascular systems which is also associated with a reduction in the production of erythropoietin. This larger problem is also in part due to associated iron deficiency which exacerbates the problem of anemia. These factors together compromise homeostasis and prolong bleeding episodes[16]. This study also showed significantly lower baseline hemoglobin levels within the CKD group, illustrating their greater exposure to decompensation during episodes of acute blood loss. Cardiovascular disease is another critical factor that makes this population even more at risk. The presence of CVD further complicates the management of GIB since many of these patients are on continuous anti-thrombotic or anti-platelet treatments for the secondary prevention of ischemic events. While these medications are life-saving, they pose an even greater risk of bleeding, especially in patients with impaired renal function[17]. This is why, in this particular study, CKD patients had significantly higher re-bleeding rates and transfusion requirements. Previous studies demonstrated that, in patients with ischemic heart disease, gastro-intestinal bleeding can cause severe hemodynamic instability and anemia that may lead to myocardial ischemia, arrhythmias, or even acute heart failure[18]. In this study, patients with CKD had higher rates of longer hospital stays and ICU admissions which may suggest their greater cardiovascular frailty and longer time to recovery. These findings indicate that renal dysfunction does not merely coexist with adverse outcomes, but that it also exacerbates the physiological burden of bleeding and the loss of the patient's ability to compensate, leading to even worse outcomes[19]. In this study, analysis found that CKD, low baseline hemoglobin, and diabetes mellitus are all independent predictors of in-hospital mortality. When integrated with other variables, CKD almost tripled the mortality odds and this underscores the value of its prediction. Anemia and diabetes, common co-morbidities associated with renal dysfunction, may act together in a way that is worse for outcomes[20]. Anemia worsens myocardial ischemia by a decrease in oxygen delivery and diabetes worsens the extent of vasculature damage and slows the rate of healing of mucosal tissue which is indicative of greater blood loss and a slower recovery. This study's outcomes can influence clinical practice. When patients with GIB first present, it is important to identify CKD early in the course of the disease for prognostic and management purposes. Therefore, renal function baseline tests should immediately be conducted in all patients to direct clinical management and to prepare for possible adverse outcomes[21]. Such patients with CKD should be classified as a distinct, high-risk population for which more intense surveillance of hemodynamics, early nephrology referral, and more careful use of nephrotoxic medications are warranted. The relationship between CKD, CVD, and GIB can be thought of one as a vicious cycle. With regard to bleeding, CKD is a contributor by way of uremic platelet dysfunction and weak blood vessels, while GIB causes a loss of hemodynamic stability and a decrease in blood volume which can worsen renal ischemia and cardiac ischemia. Simultaneously, bleeding risks from dual antiplatelet therapies and anticoagulation treatments for CVD continue to exacerbate each other's impact. This triad requires a combined focus on rheostatic control, renal protection, and CVD stability.

Limitations: Several limitations should be acknowledged. First, the cross-sectional nature of the study limits the ability to establish causal relationships between CKD and adverse outcomes. Second, the study was conducted at a single center, which may affect generalizability to other populations with different demographic or healthcare profiles. Third, the severity and stage of cardiovascular disease were not stratified in detail, which could influence outcomes. Fourth, medication use, such as specific antiplatelet or anticoagulant regimens, was not quantified, though it likely played a role in bleeding severity. Lastly, long-term outcomes such as 30-day mortality or recurrent admissions were not assessed, and future longitudinal studies are needed to capture these aspects.

CONCLUSION

It is concluded that chronic kidney disease significantly worsens the prognosis of patients presenting with gastrointestinal bleeding and coexisting cardiovascular disease. CKD was associated with higher mortality, increased transfusion needs, prolonged hospitalization, and greater risk of rebleeding and acute kidney injury. The presence of CKD, anemia, and diabetes were independent predictors of poor outcomes.

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