

Rates and Characteristics of Acute Kidney Injury in an Australian CKD Registry

GJ WILSON^{1,2}, A MALLET^{1,2}, A KARK^{1,2}, AK TAN, A CAMERON, Z WANG, HG HEALY^{1,2}, WE HOY^{2,4} on behalf of the NHMRC CKD.CRE and the CKD.QLD collaborative: www.ckdqld.org

¹ Kidney Health Services (RBWH), Metro North Hospital and Health Service, Brisbane, QLD, Australia; ² NHMRC CKD.CRE & CKD.QLD; ³ Centre for Chronic Disease, The University of Queensland, Australia; ⁴ Department of Renal Medicine, Logan Hospital, Queensland

Background and Aim

- The relationship between acute kidney injury (AKI) and chronic kidney disease (CKD) is bidirectional¹. AKI is an independent risk factor for the development of CKD and patients with CKD have an increased risk of acute on chronic kidney injury¹.
- Several risk factors have been associated with both CKD following AKI and acute on chronic kidney injury, including age, severity of AKI, diabetes mellitus and proteinuria². Whether other risk factors contribute to this bi-directional relationship remains unclear.
- Acute tubular injury has been identified as a potential risk factor for the development and progression of CKD². Whether patients who have an AKI with significant tubular injury (such as in acute tubular necrosis or obstructive nephropathy) are more likely to develop CKD is unknown.
- We utilize the CKD.QLD registry to describe the rates and characteristics of patients with AKI comparing patient demographics, co-morbidities and aetiologies to confirm AKI as an independent risk factor for CKD and investigate whether different AKI aetiologies increase the risk of developing CKD.

Methods

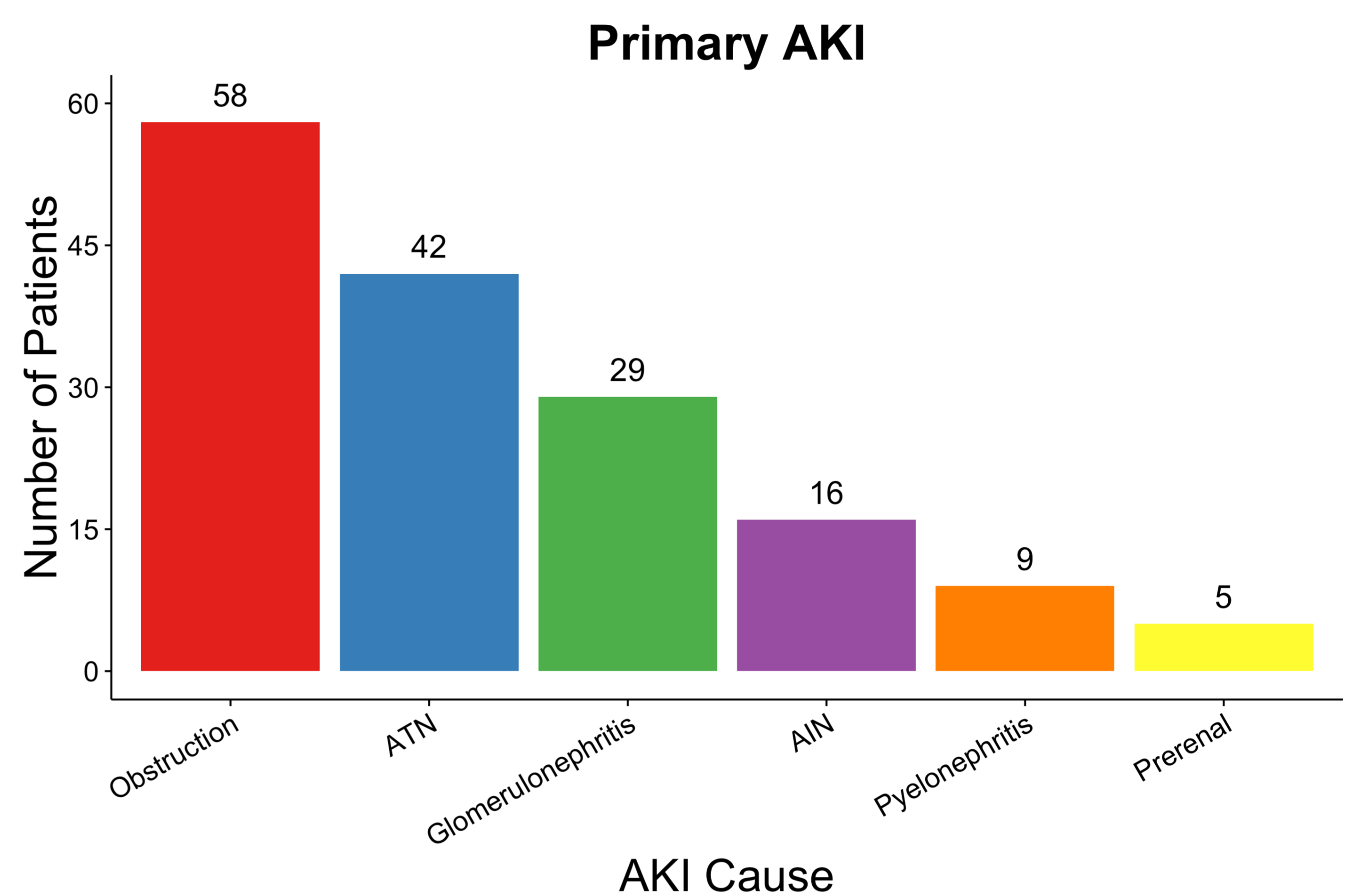
- Patients enrolled in the CKD.QLD registry from Logan Hospital and RBWH (n=2367) were assessed for a diagnosis of AKI either as the cause of CKD or as an acute on chronic kidney injury. Patients who had an AKI as the cause of their CKD were categorised as Primary AKI. Patients who had an acute on chronic kidney injury were categorized as AKI on CKD. The remaining patients were used as a comparator group (CKD only).
- These groups were further divided by the cause of their AKI into pre-renal AKI, acute interstitial nephritis (AIN), acute tubular necrosis (ATN), pyelonephritis, glomerulonephritis and obstructive nephropathy.
- Patient demographics, co-morbidities and cause of AKI between and within these groups were compared.

Results

- 159 patients (6.7%; 61.4% male) had an AKI as the cause of their CKD (Primary AKI) and 176 (7.4%; 55.1% male) had an acute on chronic kidney injury (AKI on CKD). The remaining 2032 (85.8%; 50.3% male) did not have an AKI and were categorised as CKD only.
- Patients with AKI as the cause of CKD (primary AKI) had significantly lower rates of traditional risk factors for CKD compared to CKD only (p<0.01; **Figure 1**). This finding is consistent with previous studies and demonstrates that AKI is a significant and independent risk factor for developing CKD.

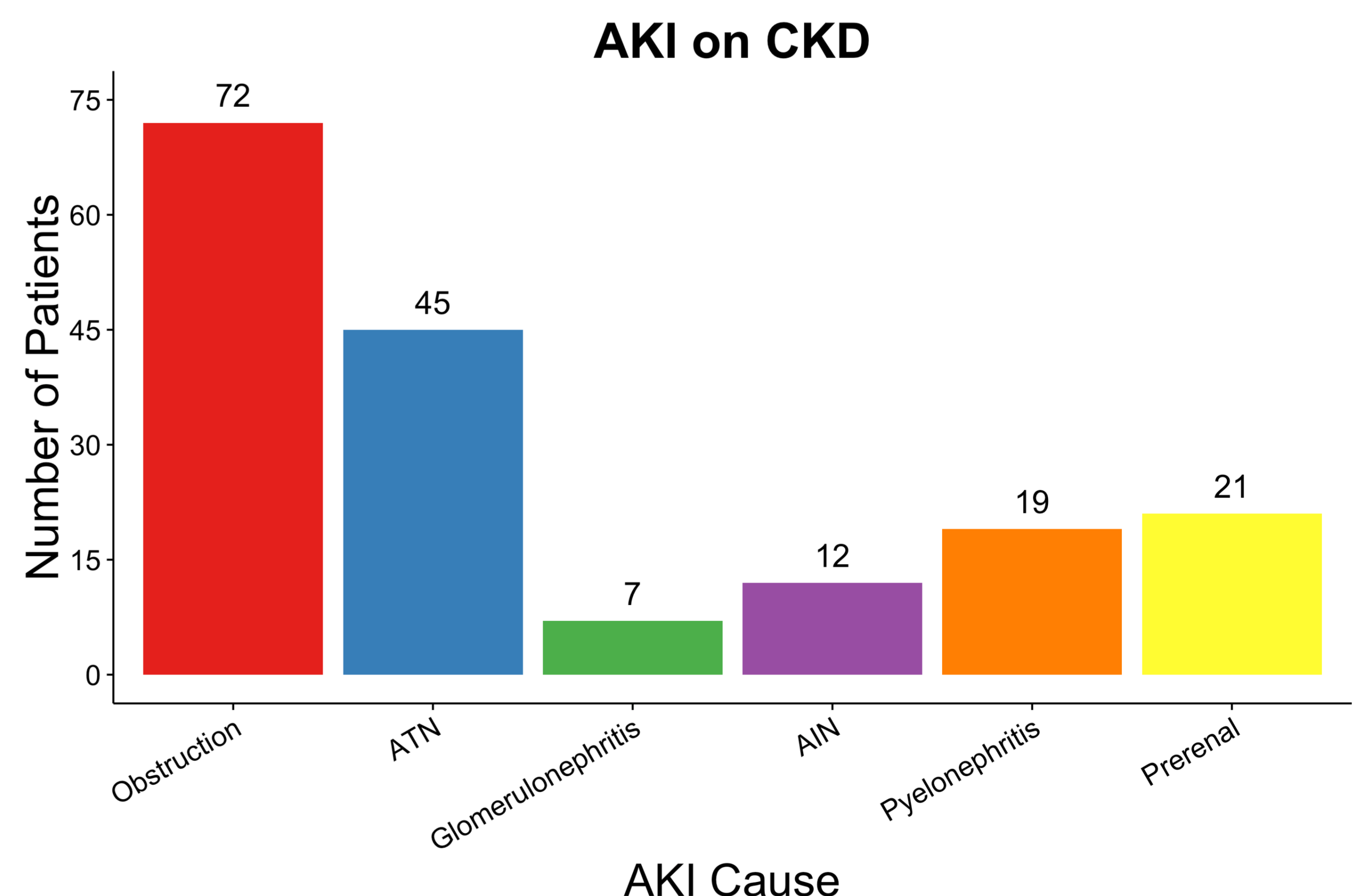
- Primary AKI patients had high rates of obstructive nephropathy and ATN (36.5% and 26.4% respectively) as the cause of AKI (**Figure 2**).
- Obstructive nephropathy and ATN were more common in men (65.8% and 56.3% male respectively).
- ATN and obstructive nephropathy are characterized by acute tubular injury. The high prevalence of these two causes of AKI in patients with CKD suggests acute tubular injury may be a risk factor for developing CKD.

Figure 2. Patients with CKD due to AKI in descending frequency categorized by AKI aetiology.



- AKI on CKD patients also had high rates of both obstructive nephropathy and ATN (40.9% and 25.6% respectively) as the AKI aetiology (**Figure 3**).
- Obstructive nephropathy was more common in men (73.6%). Gender was more evenly distributed in patients with ATN (53.3% male) compared to patients with ATN in the primary AKI group.
- Comorbidities did not differ significantly by cause of AKI for both the primary AKI and AKI on CKD groups.

Figure 3. Patients with acute on chronic injury categorised by AKI aetiology.



Conclusions

- These findings demonstrate the bi-directional relationship between AKI and CKD.
- We confirm that AKI is a significant risk factor for the development of CKD even in the absence of traditional CKD risk factors.
- Obstructive nephropathy and ATN were the most common causes of AKI.
- Patients with ATN or obstructive nephropathy may be at higher risk of developing CKD due to acute tubular injury.

References:

- ¹ Hsu Y et al. The Risk of Acute Renal Failure in Patients with Chronic Kidney Disease. *Kidney Int*, 2011, 79
- ² Amdur R et al. Outcomes following Diagnosis of Acute Renal Failure in US Veterans: Focus on Acute Tubular Necrosis. *Kidney Int*. 2009, 76

Figure 1. Prevalence of risk factors for CKD by cause of CKD.

