



# Expanding Horizons in Nephrology - From Acute Viral Insults to Biomarker-Guided Therapies

Rahman MM

The landscape of nephrology continues to evolve rapidly through clinically relevant observational studies and translational research that deepen our understanding of kidney disease mechanisms, prognostication, and patterns of pathology. The current issue brings together four timely and thought-provoking articles that highlight the breadth of renal research from acute kidney involvement in infectious diseases to molecular markers guiding therapy in hematologic malignancies.

## 1. Renal Involvement in Hospitalized COVID-19 Patients Without Pre-Existing Kidney Disease

When the global COVID-19 pandemic emerged, early emphasis was placed on respiratory failure. However, it soon became clear that kidney involvement is both common and prognostically significant in hospitalized patients, even in those without previously diagnosed kidney disease. Prior work has established that acute kidney injury (AKI) complicates a large proportion of severe COVID-19 cases and may be associated with increased mortality, need for renal replacement therapy, and long-term kidney function decline<sup>1</sup>.

Recent retrospective cohorts have emphasized that impaired renal function at admission, even in patients without documented CKD history, carries a significantly higher risk of critically ill outcomes and in-hospital death compared with patients with normal renal function<sup>2</sup>. The implications are considerable: clinical vigilance and routine assessment of eGFR, urinalysis, and early biomarkers of kidney stress should be integrated into COVID-19 care pathways, especially for older individuals and those with cardiometabolic risk factors. Recent meta-analyses suggest AKI incidence in COVID-19 patients ranges between 20–40%, with significant impact on mortality outcomes<sup>3,4</sup>.

Moreover, autopsy and biopsy series suggest that AKI in COVID-19 may stem from a heterogeneous spectrum of

histopathologic injuries, including acute tubular injury as well as glomerular lesions such as collapsing glomerulopathy in select subgroups.

## 2. Spectrum of Glomerulonephritis and Trends of Its Changing Patterns

A clear understanding of the spectrum of glomerulonephritis (GN) is central to nephrology because histological patterns often drive diagnosis, therapy, and prognosis. Biopsy registries across multiple geographies have documented shifting trends in GN frequency and type over recent decades, likely influenced by changes in socioeconomic factors, infectious exposures, and epidemiologic transitions<sup>5</sup>. This retrospective study highlights shifting patterns in GN subtypes in Bangladesh, reflecting both improved diagnostic capabilities and changing environmental exposures. In this study Mesangial proliferative GN comprising of IgA nephropathy and C1q nephropathy constituted a significant subset followed by MPGN and FSGS. There has been a rising incidence of FSGS in Southeast Asia in recent years. These trends highlight the necessity of robust regional biopsy registries and systematic pathology surveillance to inform clinical trials, guideline development, and resource planning.

## 3. Urinary NGAL and $\beta$ 2-Microglobulin in Predicting Treatment Response and Outcomes

The introduction of effective therapies for hematologic malignancies, such as bortezomib-based chemotherapy in multiple myeloma, has revolutionized patient survival. Nevertheless, treatment-related kidney injury remains a concern, and there is increasing interest in the prognostic utility of urinary biomarkers that reflect early tubular damage.

Although specific prospective studies on urinary NGAL (neutrophil gelatinase-associated lipocalin) and  $\beta$ 2-microglobulin in the context of bortezomib response are emerging, broader evidence supports the predictive value

of urinary NGAL for adverse kidney outcomes and CKD progression across a range of settings, including chronic nephropathies<sup>6</sup>. Such biomarkers may outperform traditional creatinine measurements for detecting subclinical injury, forecasting recovery trajectories, and potentially guiding therapy adjustments.

Urinary  $\beta$ 2-microglobulin also correlates with tubular dysfunction and has been used in oncology cohorts to track late nephrotoxicity after cytotoxic chemotherapy<sup>6</sup>. As next-generation biomarkers become integrated with clinical practice, they have the potential to refine risk stratification and personalize care paradigms for patients undergoing high-intensity therapies.

#### 4. Kidney Injury Molecule-1 (KIM-1): Patterns Across CKD Stages

Kidney Injury Molecule-1 (KIM-1) has emerged as a sensitive marker of proximal tubular injury and a predictor of CKD progression. In diverse cohorts, urinary KIM-1 levels correlate with disease severity and have been associated with faster declines in kidney function and greater risk of adverse outcomes<sup>7</sup>.

Understanding the pattern of KIM-1 expression across different CKD stages may deepen mechanistic insights into tubular maladaptation and fibrosis, processes that often herald the transition from acute injury to chronic structural damage. Although KIM-1 alone may not fully capture long-term progression risk in all contexts (e.g., early post-AKI recovery), its integration with other biomarkers (including NGAL and  $\beta$ 2-microglobulin) and structural measures could enhance multimodal prognostic models.

#### Conclusion

Together, these articles reflect the dynamic landscape of nephrology: acute viral challenges, evolving glomerular disease patterns, biomarker-guided oncology-nephrology intersections, and molecular insights into CKD progression. They remind us that nephrology is not confined to the kidney alone but is deeply interwoven with systemic health, infectious disease, oncology, and molecular medicine. The future of nephrology lies in embracing this multidimensionality integrating epidemiology, clinical vigilance, and biomarker innovation to improve patient outcomes.

#### References:

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