

## Nutritional Status and CKD Outcomes: Mortality and Quality of Life

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Observational studies in chronic kidney disease (CKD) including dialysis populations consistently have shown the strong mortality-predictability of such markers of protein-energy wasting (PEW) as hypoalbuminemia, low serum cholesterol levels, low body mass index, and reduced dietary protein intake.<sup>1, 2)</sup> Even though the PEW-mortality association data traditionally are reported mostly in maintenance dialysis patients, emerging studies extend the existence of these associations to predialysis stages of CKD, kidney transplant patients and AKI. Paradoxical risk factor patterns (reverse epidemiology) for both obesity and cholesterol recently have been reported in predialysis CKD, underscoring the overwhelming impact of PEW, a short-term killer, on reversing the long-term effect of conventional cardiovascular risk factors. Multiple pathophysiologic mechanisms have been suggested to explain the link between PEW and mortality in CKD, including derangements in muscle, adipose tissue, and the gastrointestinal, hematopoietic, and immune systems; complications related to deficiencies of multiple micronutrients; and the maladaptive activation of the inflammatory cascade. In addition to well-described pathophysiologic mechanisms involved in the higher mortality seen with PEW, the potential role of novel factors such as proinflammatory lipoproteins and cytokines and platelet activation should be considered. A current hypothesis of the cause of PEW in chronic illness is that proinflammatory cytokines such as tumor necrosis factor- $\alpha$  and interleukin-6 act on the central nervous system to alter the release and function of several key neurotransmitters, thereby altering both appetite and metabolic rate. Whether PEW is causally related to adverse outcomes in CKD needs to be verified in randomized controlled trials of nutritional interventions. High protein diet, appetite stimulating agents, and anti-inflammatory and anti-oxidative interventions may improve PEW in CKD patients. In particular, oral nutritional supplements with low phosphorus to protein ratio are most suitable to patients with advanced CKD.<sup>3)</sup> In pre-dialysis patients, moderately low protein diet ( $-0.6$  g/kg/d)  $\pm$  keto-analogues should be considered. The initiation of major clinical trials targeting nutritional interventions with the goal of improving survival in CKD offer the promise of extending the survival of this vulnerable patient population.

### References

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