DIALYSIS

Dialysis patients benefit from the high life

Altitude is inversely associated with all-cause mortality among patients on dialysis in the US, according to researchers at Brigham and Women's Hospital and Harvard Medical School.

Previous research had shown that individuals with end-stage renal disease (ESRD) who live at high altitudes achieved higher hematocrit levels with smaller erythropoietin doses than those who live at lower altitudes. These findings suggested that hypoxia-induced factors might improve iron availability, and Winkelmayer *et al.* hypothesized that activation of these factors might also translate into decreased mortality.

The researchers used data from the US Renal Data System on 804,812 patients who started hemodialysis or peritoneal dialysis in the US between 1995 and 2004. They stratified patients into five groups based upon the elevation of their place of residence. Most patients (94.9%) lived at <76 m or 76–609 m; just 2.8%, 1.9% and

0.4% of patients lived at 610–1,218 m, 1,219–1,828 m and >1,828 m, respectively. The crude mortality over a median follow-up of 1.78 years was significantly higher among individuals living at altitudes <76 m than in those residing at altitudes >1,828 m (220.1 deaths per 1,000 person-years versus 177.2 deaths per 1,000 person-years). Median survival after dialysis initiation was 3.1 years for patients at the lowest altitude and 4 years among those at the highest altitude. Analyses adjusted for multiple factors including age, sex, ethnicity, comorbidities, BMI, glomerular filtration rate and hemoglobin level confirmed that survival improved with increasing residential altitude: mortality was 3%, 7%, 12% and 15% lower among individuals living at 76–609 m, 610–1,218 m, 1,219–1,828 m and above 1,828 m, respectively, compared with those living below 76 m. Although Winkelmayer *et al.* also reported decreased mortality with increased residential altitude in the

general population, the risk reductions were much lower than those seen among patients on dialysis.

“We propose that hypoxia-inducible factors are persistent at high altitude in patients with ESRD and may confer protective effects,” conclude the investigators.

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Original article Winkelmayer, W. C. *et al.* Altitude and all-cause mortality in incident dialysis patients. *JAMA* 301, 508–512 (2009).