

Dialysis patients residing at higher altitude have lower rate of death

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Compared to dialysis patients living near sea level, dialysis patients living at an altitude higher than 4,000 feet have a 12-15 percent lower rate of death, according to a study in the February 4 issue of *JAMA*.

A recent study found that patients with end-stage renal (kidney) disease (ESRD) living at higher altitude achieved greater hemoglobin concentrations (a protein in red blood cells that primarily transports oxygen from the lungs to the rest of the body) while receiving lower doses of erythropoietin (a hormone that stimulates the production of red blood cells). Increased iron availability caused by activation of hypoxia-induced (oxygen deficiency) factors at higher altitude may explain this finding, according to background information in the article.

Wolfgang C. Winkelmayer, M.D., Sc.D., of Brigham and Women's Hospital and Harvard Medical School, Boston, and colleagues examined whether increased altitude would be associated with a reduced rate of death for patients initiating chronic dialysis. Using a comprehensive dialysis registry, the researchers identified 804,812 patients with ESRD who initiated dialysis between 1995 and 2004 and who met the study entry requirements. Most patients resided below an altitude of 250 ft. (40.5 percent) or between 250-1,999 ft. (54.4 percent). Only 1.9 percent of incident dialysis patients lived between 4,000 and 5,999 ft. and 0.4 percent higher than 6,000 ft. Patients were stratified by the average elevation of their residential zip code.

Compared with patients living at lower altitudes (less than 250 ft.), the

rate of death was reduced for patients living from 250-1,999 ft. by 3 percent; from 2,000 through 3,999 ft. by 7 percent; from 4,000 to 5,999 ft. by 12 percent; and higher than 6,000 ft. by 15 percent.

Actuarial 5-year survival was 34.8 percent for patients living at or near sea level but was 42.7 percent among those living at an altitude higher than 6,000 ft.; patients in the highest elevation group experienced a 7.9 percent greater absolute or 22.7 percent greater relative 5-year survival. Median (midpoint) survival after initiation of dialysis was 3.1 years for those living lower than 250 ft. but was 4.0 years for those living at an altitude higher than 6,000 ft., for a difference in median survival of 0.9 years between these 2 groups.

While a decrease in age- and sex-standardized mortality at higher altitude was also observed in the general population, the magnitude of the risk reduction was half of that observed in the ESRD population.

"In conclusion, we found a graded reduction in mortality from any cause in ESRD patients residing at greater altitude, a finding that was not explained by differences in observed patient characteristics. The magnitude of this observation was markedly greater than the observed small reduction in mortality at higher altitude in the general population. We propose that hypoxia-inducible factors are persistent at high altitude in patients with ESRD and may confer protective effects," the authors write.

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