

Calcium, Phosphorus, Parathyroid Hormone, and Cardiovascular Disease in Hemodialysis Patients. The USRDS Waves 1, 3, and 4 Study.

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Although animal studies suggest that calcium-phosphorus homeostatic abnormalities cause cardiovascular disease in uremia, few observational studies have explored these relationships. We examined the associations between calcium, phosphorus, calcium-phosphorus product, parathyroid hormone levels, parathyroidectomy, and hospitalized cardiovascular disease in the retrospective USRDS Waves 1, 3, and 4 Study, which included 14,859 patients prevalent on hemodialysis on December 31, 1993. Mean patient age and duration of renal replacement therapy were 60.0 and 3.2 years, respectively; 40.7% had diabetes mellitus. The quintiles (Q_1 to Q_5) of (albumin-adjusted) serum calcium were 8.7, 9.2, 9.6, and 10.2 mg/dl; phosphorus, 4.4, 5.3, 6.3, and 7.5 mg/dl; calcium-phosphorus product, 40.9, 50.1, 59.2, and 71.0 mg^2/dl^2 ; and parathyroid hormone, 37, 98, 210, and 480 pg/dl. Higher calcium levels were not associated with cardiovascular events but were associated with mortality (adjusted hazards ratios [AHR] compared to Q_1 were: Q_4 , 1.14; Q_5 , 1.18). Phosphorus levels were associated with cardiovascular events (Q_2 AHR, 1.09; Q_3 , 1.19; Q_4 , 1.18; Q_5 , 1.27) and mortality (Q_4 AHR, 1.14; Q_5 , 1.25). Calcium-phosphorus product was associated with cardiovascular events (Q_2 AHR, 1.10; Q_3 , 1.09; Q_4 , 1.19; Q_5 , 1.27) and death (Q_4 AHR, 1.14; Q_5 , 1.27). Parathyroid hormone levels were associated with cardiovascular events (Q_5 AHR, 1.14) and death (Q_2 AHR, 1.08; Q_4 , 1.09; Q_5 , 1.27). Parathyroidectomy was associated with lower rates of peripheral vascular disease (AHR, 0.57) and death (AHR, 0.47). We conclude that disorders of calcium homeostasis, especially high phosphorus and calcium-phosphorus product levels, are associated with cardiovascular events and death in hemodialysis patients.