Mortality Predictability of the 5-Year Time-Averaged Serum Calcium in 151,555 Maintenance Hemodialysis Patients

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Background

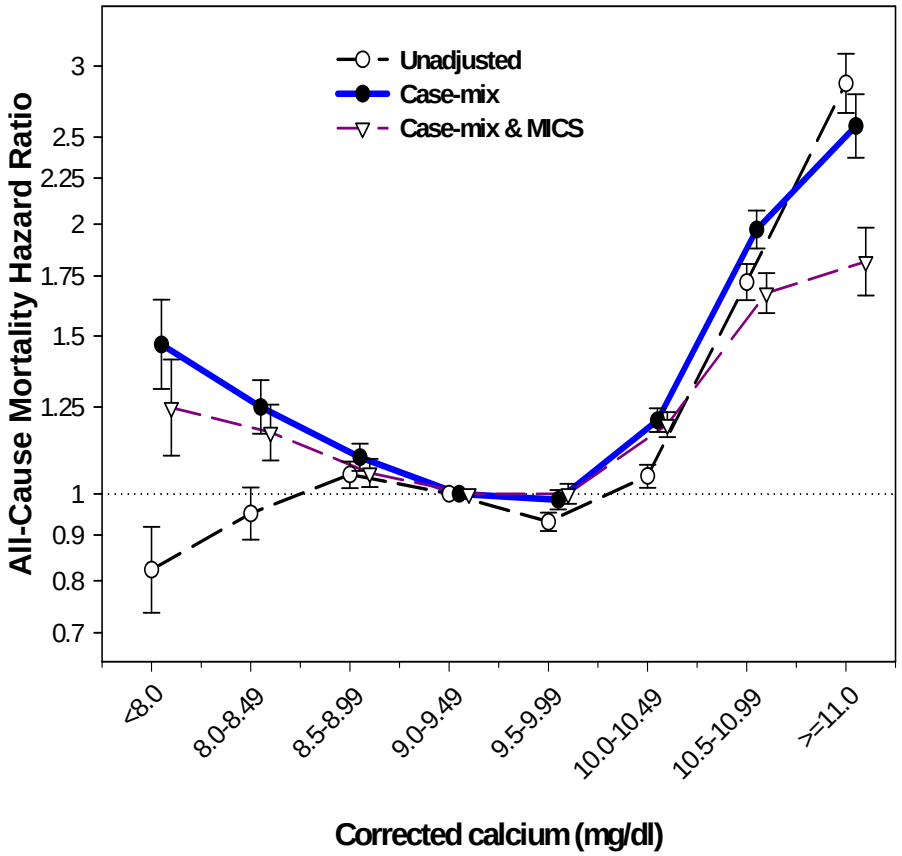
- Several epidemiologic studies have examined the mortality-predictability of "baseline" serum calcium in maintenance hemodialysis (MHD) patients, ignoring subsequent serum calcium values over time.
- However, the time-averaged values, by accounting for all monthly measured serum calcium levels up to the time of death or censorship, may more appropriately reflect the cumulative effect of serum calcium over time on survival

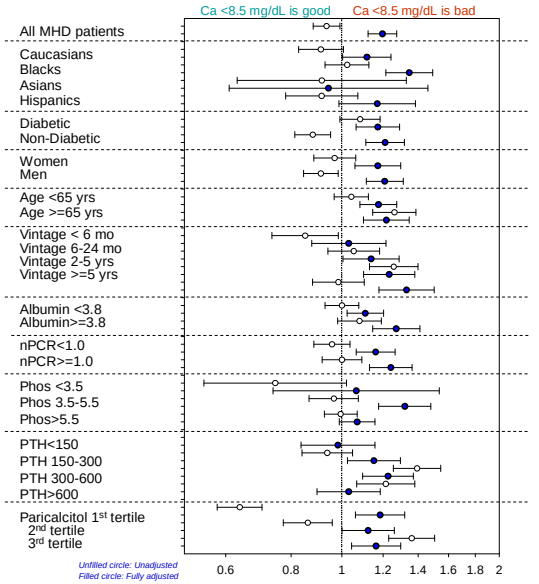
Methods

- In a large and contemporary cohort of 151,555 MHD patients who underwent dialysis treatment for at least 3 months in all legacy DaVita dialysis clinic between July 2001 and June 2006, all monthly measured (and albumin adjusted) serum calcium levels were averaged into one single value per patient during the entire follow-up time, i.e., up to 5 years.
- Analytical Method: Cox survival modeling
- The death hazard ratio (and 95% CI) of the serum calcium were calculated at 3 levels of multivariate adjustments:
  - Unadjusted
  - Case-mix adjusted: Demographics and comorbidity (age, gender, race/ethnicity, diabetes, vintage, insurance, martial status) and dialysis dose (Kt/V)
  - Malnutrition-inflammation complex syndrome (MICS) adjusted: Protein intake (nPNA or nPCR), administered EPO dose, serum albumin, creatinine, phosphorus, ferritin, TIBC, hemoglobin, WBC, and lymphocyte%, paricalcitol dose,

Results

- In a logistic regression model case-mix-adjusted for age, gender, race, comorbidity, vintage, and dialysis dose,, the odds ratio of achieving the highest quartile in ESA responsiveness (versus the lowest quartile) increased progressively with increasing serum calcium level.
- For each 1 mg/dL increase in 3-month averaged serum calcium, odds ratio increased by 1.27 (95% CI: 1.22-1.32, p<0.001). Hypocalcemia (Ca <8.4 mg/dL) was associated with an adjusted odds ratio of 0.61 (95% CI: 0.55-0.68, p<0.001); see Figure 1 (below):





Conclusions

In 151,555 prevalent MHD patients who were followed for up to 5 years, cumulative hypercalcemia (>10.5 mg/dL) was associated with 2 to 2.5 times increased death risk and cumulative hypocalcemia (<8.5 mg/dL) with 25% to 50% higher death risk.

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