

Association of Low Serum Calcium with ESA Hyporesponsiveness in Hemodialysis Patients

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Background

- Both hypercalcemia and high ESA dose requirements are each associated with increased morbidity and mortality in maintenance hemodialysis (MHD) patients.
- It is not known which level of calcium is associated with the greatest ESA responsiveness.

Hypothesis

- We hypothesized that serum calcium level may be associated with ESA responsiveness.

Methods

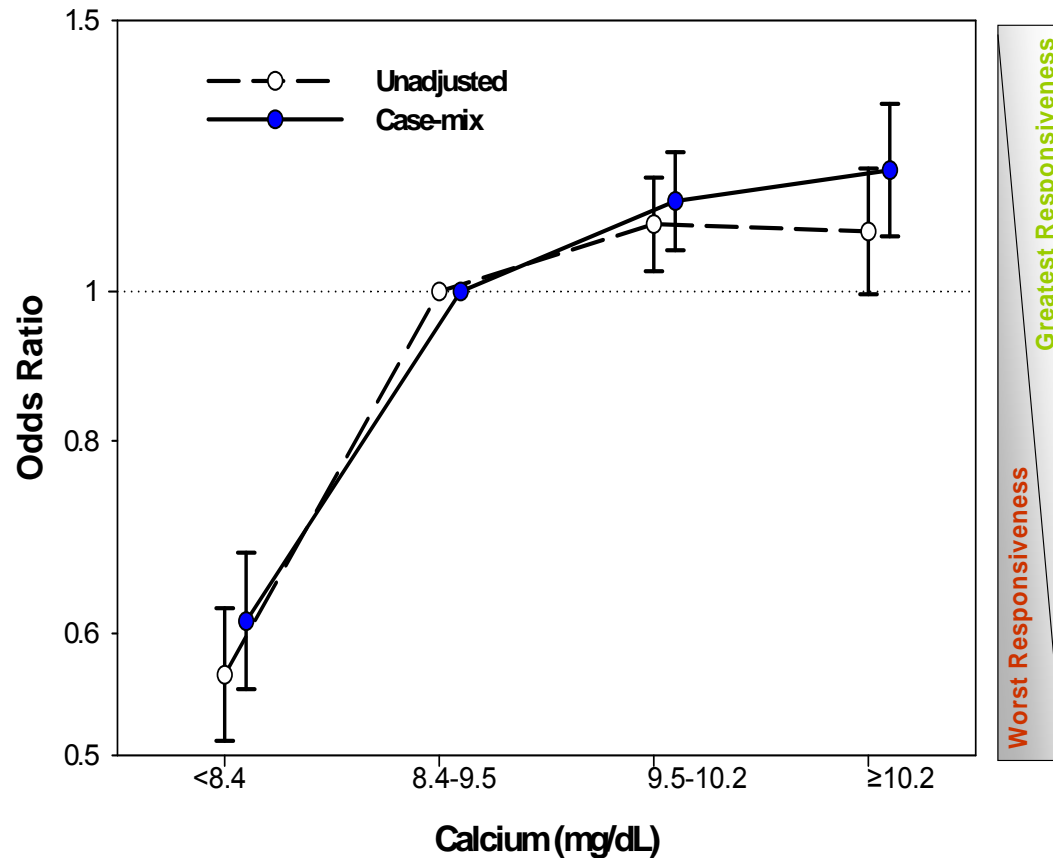
- We examined Hb response to ESA treatment in a 12-month (July 2001-June 2002) cohort of 38,328 MHD patients across the USA.
- All patients had received ESA for at least 3 consecutive calendar quarters.
- Using repeated measure models, the ESA response coefficient at individual level was separated from the population responsiveness.
- Cross-sectional (conventional) model:

$$\text{Hemoglobin}_i = \beta \cdot r\text{HuEPO}_i + \varepsilon_i$$

- Longitudinal (repeated measure) model:

$$\text{Hemoglobin}_{ij} = \beta_c \cdot r\text{HuEPO}_{ij} + \beta_L \cdot (r\text{HuEPO}_{ij} - r\text{HuEPO}_{i1}) + \varepsilon_{ij}$$

Results



Greatest Responsiveness

Worst Responsiveness

Serum Calcium & EPO Responsiveness

- 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.

Calcium & EPO Responsiveness

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); Figure:

Conclusions

- In this retrospective cohort analysis, hypocalcemia, but not hypercalcemia, was associated with ESA hyporesponsiveness in MHD patients. Limitations of observational data should be considered in interpreting these findings.

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