

Higher Serum Total Alkaline Phosphatase is Associated with Lower Bone Mineral Density in Hemodialysis Patients

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INTRODUCTION

Although *renal osteodystrophy* is common in maintenance hemodialysis (HD) patients, its clinical and laboratory correlates are poorly understood. Recently, serum alkaline phosphatase (AlkPhos), a surrogate of high turnover bone disease, has been shown to correlate with increased mortality (Regidor et al, *JASN* 2008) and coronary artery calcification (Shantouf et al, *CJASN* 2009) in HD patients.

We hypothesized that AlkPhos correlates with bone mineral density (BMD) in HD patients.

METHODOLOGY

- We examined 154 HD patients from 8 DaVita clinics in Los Angeles South Bay area who participated in the "Nutrition & Inflammation in Dialysis Patients" (NIED) Study cohort and who underwent Dual-Energy X-Ray Absorptiometry (DEXA) to assess their BMD score.
- Patients were 55.3±13.6 years old and included 42% women, 38% Hispanic, 42% African-American and 55% diabetic.
- The mean AlkPhos was 121±63 U/L (median: 101, Q25-75: 81-141); 36% had AlkPhos ≥120 U/L and 50% had a total T-score ≤-1.

RESULTS

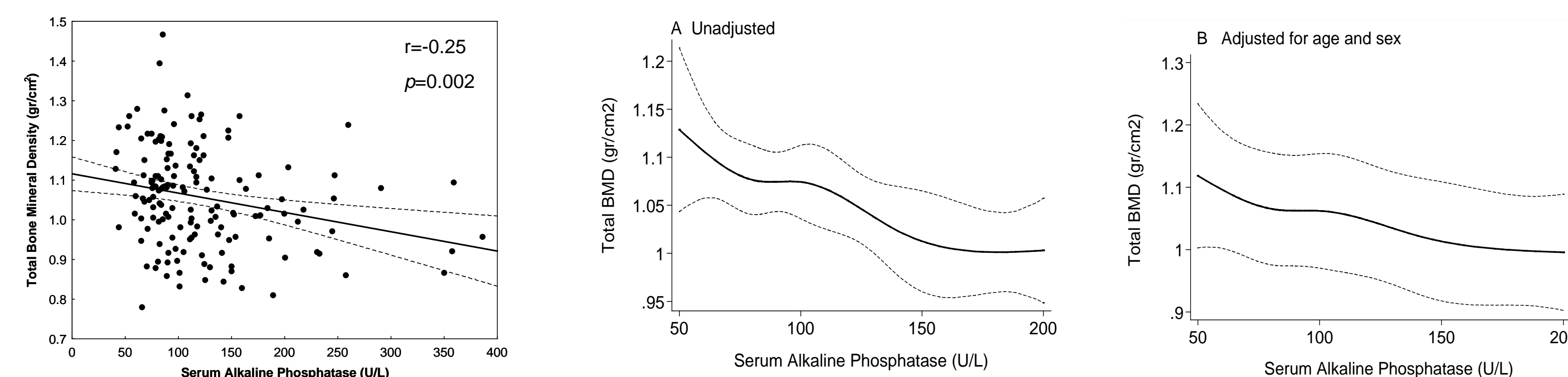


Figure 1: Right Panel: Scatter plot regression line (with 95% CI) reflecting the correlation between AlkPhos and BMD. **Middle Panel:** Regression spline models of association between AlkPhos and BMD in 154 HD patients in Unadjusted model. **Left Panel;** Adjusted for age/sex

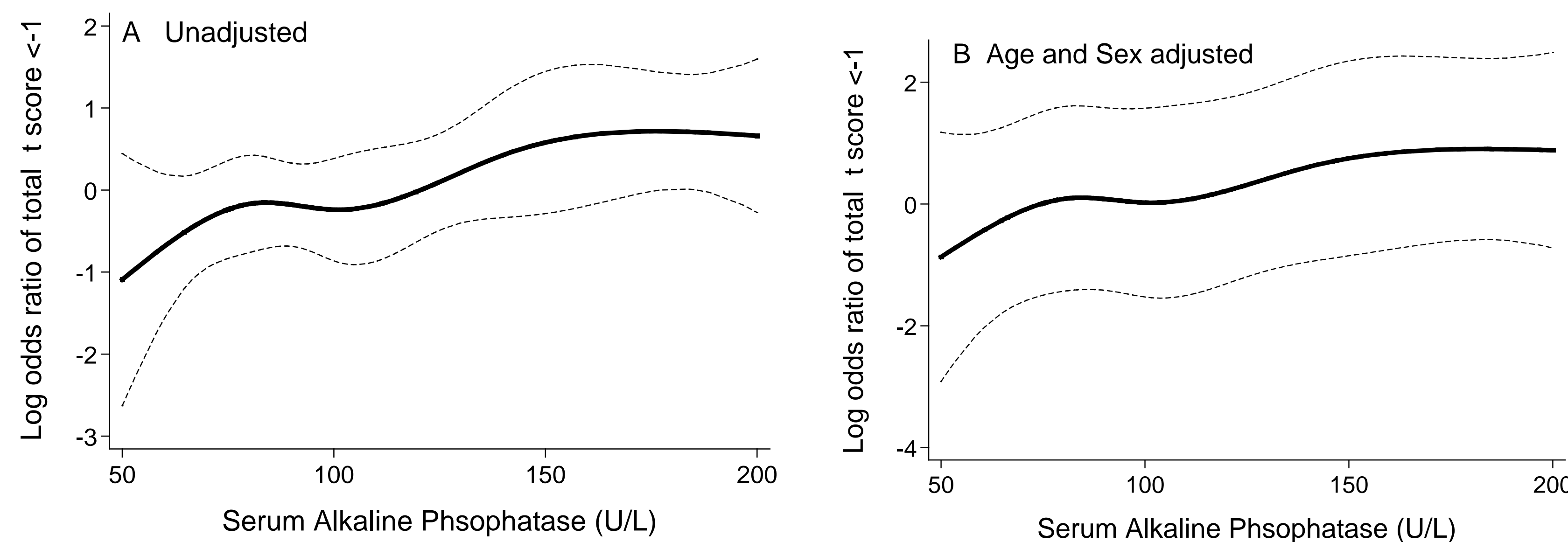


Figure 2: Logistic regression spline models of the association between the likelihood of high serum AlkPhos ≥120 U/L as predictor of a total T-score ≤-1 in 154 HD patients

CONCLUSIONS

- Total BMD was not correlated with age ($r=0$, $p=0.99$) and body mass index ($r=0.10$, $p=0.22$), it was correlated with AlkPhos ($r=-0.25$, $p=0.002$), a correlation which was robust after multivariate adjustment ($r=-0.24$, $p=0.003$). Total BMD was significantly lower in HD patients with serum AlkPhos ≥120 U/L compared to <120 U/L ($1.01±0.016$ g/cm² vs. $1.08±0.013$, respectively, $p<0.001$).
- The multivariate adjusted odds ratio (OR) of AlkPhos ≥120 U/L for having a total T-score <-1.0 was 2.25 (1.05-4.81, $p=0.037$). Among all routine clinical and biochemical markers, serum AlkPhos ≥120 U/L was the strongest predictor of total T-score ≤-1 in HD patients (see Figures).

KEY LEARNINGS

- ✓ Given the association of AlkPhos with all-cause mortality and coronary artery calcification, and its strong association with bone loss, monitoring of AlkPhos levels may provide additional guidance in the clinical decision-making processes for CKD-MBD management.

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