THE ROLE OF SERUM MAGNESIUM (s-Mg) AND CALCIUM (s-Ca) LEVELS IN THE ASSOCIATION BETWEEN PROTEIN-ENERGY WASTING (PEW) AND MORTALITY IN END-STAGE RENAL DISEASE (ESRD) PATIENTS

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OBJECTIVES

PEW, which can be reliably assessed by the malnutrition-inflammation score (MIS), is associated with adverse clinical outcomes in ESRD patients. Low s-Mg and high s-Ca levels have been also consistently associated with increased risk of morbidity and mortality in ESRD. Here, we examined a) whether and to what extent s-Mg and s-Ca reflect the nutritional-inflammation status of ESRD patients, as assessed by the MIS, and b) the interrelations between the altered mineral metabolism, MIS and mortality in uremic patients

METHODS

One hundred and thirty six ESRD patients, 82 on hemodialysis and 54 on peritoneal dialysis, after baseline assessment, including the MIS and other nutritional, biochemical and anthropometric markers, were followed-up for all-cause mortality. Since a higher score of the MIS (0 to 30) reflects a more severe degree of malnutrition and inflammation, patients in the lower (0-4) and middle (5-7) tertiles of MIS were defined as well nourished, whereas patients in the upper tertile (≥ 8) of MIS were consider as malnourished.

RESULTS

As compared to well nourished, malnourished patients were older, had longer renal replacement therapy (RRT) vintage, higher prevalence of cardiovascular disease (CVD), lower s-Mg (2.29 0.27 vs. 2.49 0.47 mg/dl; $p<0.05$) and higher s-Ca (9.46 0.78 vs. 9.05 0.76 mg/dl; $p<0.01$) levels, respectively. The MIS correlated inversely (all rho >-0.210) with all the nutritional markers measured: serum albumin, transferrin, creatinine and positively ($r=0.210$; $p<0.05$) with C-reactive protein (CRP). Also, the MIS correlated inversely (all rho>-0.200) with anthropometric measurements: free fat mass, mid-arm circumference and mid-arm muscle circumference. Multivariate regression analysis ($R^2 = 0.320$; $p<0.001$) identified s-Mg (Beta= -0.316; $p<0.001$) and s-Ca (Beta =0.194; $p<0.05$) levels as significant independent predictors of the MIS, after adjustment for sex, mode of dialysis, RRT vintage, age, CVD, diabetes, body mass index, CRP and albumin. During a median follow-up period of 25 months, 35 deaths occurred. Malnourished patients had increased all cause mortality [crude hazard ratio: 2.85 (95% CI, 1.42-5.69). Likewise, all-cause mortality increased by 23 % (1.23 [1.12-1.36), for each unit increment in MIS. This MIS - mortality association persisted even after adjustment for other risk factors, including age, diabetes and anemia. However, this association lost its significance after adjusting for s-Ca and s-Mg levels, which entered the final model as independent predictors of mortality in both analyses.

CONCLUSIONS

These data show for the first time that in the ESRD setting a) low s-Mg and a high s-Ca levels appear to be reliable and robust markers of PEW and inflammation, b) altered mineral metabolism may be a link between PEW and adverse clinical outcomes and c) incorporation of s-Mg and s-Ca in a nutritional scoring system can further improve its efficiency to predict outcomes in uremia, a possibility that warrants further investigation.