SERUM MAGNESIUM LEVELS, RELATIONSHIP WITH NON-TRADITIONAL CARDIOVASCULAR FACTORS IN HEMODIALYSIS PATIENTS.

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OBJECTIVES

Patients with CKD have a high cardiovascular mortality. In the last years evidence has showed that non-traditional risk factors such as inflammation, oxidative stress, malnutrition and anemia, play an important role in all cause mortality. Additionally, recent studies have showed that low Mg levels are predictors of overall mortality in hemodialysis patients.

Although the importance of this mineral has been particularly recognized due to its anti-atherosclerotic effect, the pathway by which hypomagnesemia is associated with higher mortality in these group of patients has not been has been poorly investigated.

The aim of our study was to analyze the relationship between serum Magnesium levels and non-traditional cardiovascular risk factors in hemodialysis patients.

METHODS

In a cross-sectional study including a total of 83 hemodialysis patients we analyzed: serum magnesium levels (reference values: 1.58-2.55 mg/dl) and non-traditional cardiovascular risk factors (NTCV). We divided NTCV in fourth groups:
- **GROUP 1**: Nutritional biochemical parameters: albumin, prealbumin
- **GROUP 2**: Body composition parameters: lean body mass, fat body mass, body cell mass, phase angle (assessed by BCM Fresenius medical care).
- **GROUP 3**: Adipokins: Adiponectin, Leptin, Resistin (X-MAP technology, BioRad, Madrid, Spain),
- **GROUP 4**: Inflammation parameters: CPR (Nephelometry), IL-6 and TNF-α, (X-MAP technology, BioRad, Madrid, Spain), ESA resistance index.

RESULTS

S-Mg AND CLINICAL CHARACTERISTICS

Mean S-Mg level was 2.2±0.35 mg/dl (1.52-4.01). Only two patients (2.4%) had S-Mg>2.55. Just one patient had hypomagnesemia considering the normal range established in our center.

Comparing patients in the low quartile range of s-Mg (<2mg) to the rest of the patients we found, that patients with lower s-Mg had more comorbidities, but also by Charlson comorbidity index adjusted by age, and by a not significance trendy with CVD and DM (**TABLE 1**). Also patients in the low quartile of s-Mg had worse biochemical parameters like albumin and prealbumin and are more inflammated, depicted by a tendry of higher IL-6 (not statistically significant) and lower Hb values (**TABLE 2**).

TABLE 1. CLINICAL PARAMETERS

	n=83	Mg<2 n=21	Mg>2 n=62	p value
Age (years)	64 ± 12	63 ± 11	64 ± 12	NS
Male (%)	57 (69%)	16 (76%)	41 (66%)	NS
DV(months)	36 (13-79)	43 (16-96)	30 (10-72)	NS
BMI (kg/m²)	25 ± 4	25± 5	25±4	NS
SBP (mmHg)	135±17	137±17	134±17	NS
DBP(mmHg)	70 ± 12	68± 10	71 ±12	NS
CCIA	7 (5-9)	8 (7-9)	7 (4-8)	0.049
CVD (%)	19 (23%)	8 (38%)	11 (18%)	0.055
DM (%)	30 (36%)	11 (52%)	19 (31%)	0.073

DV: Dialysis vintage, BMI: body mass index, SBP: sistolic blood preassure, DBP: diastolic blood pressure, CCIA: Chalson comorbidity index adjusted to age, CVD: Cardiovascular disease, DM: Diabetes Mellitus

TABLE 2. NON TRADITIONAL CV RISK FACTORS

	Mg <2 n=21	Mg >2 n=62	P value
GROUP 1			
Creatinin	7.8±2.6	8.1±2.1	NS
Albumin	3.8±0.4	4.0±0.3	0.05
Prealbumin	24.8±7.6	27.6±5.0	0.05
GROUP 2			
LBM (%)	45.7±12.0	44.9±10.3	NS
FBM (%)	38.5±8.8	38.6±7.5	NS
BCM	16.5±4.4	16.4±5.7	NS
PA°	4.7±1.0	4.5±1.0	NS
GROUP 3			
Hb	11.5±0.7	12.5±1.2	<0,001
ESARIndex	13.1±11.1	10.5±9.8	NS
CPR	14.9±17.6	11.2±14.3	NS
IL-6	12.7±29.9	5.03±4.9	0.062
TNF alfa	27.0±27.5	18.4±7.1	0.029
GROUP 4			
Adiponectin	11.4±7.5	9.9±4.5	NS
Leptin	23.8±29.8	25.2±28.9	NS
Resistine	8.3±2.6	8.6±5.0	NS

LBM: Lean body mass, FBM: Fat body mass, BCM: Body cell mass, PA°: phase angle, Hb: hemoglobin, ESAR: ESA resistance

LINEAL REGRESSION MODEL

In a linear regression model, just age-adjusted Charlson comorbidity index (p=0.011) and Lean Body mass (p=0.028) showed significant association with magnesium levels.
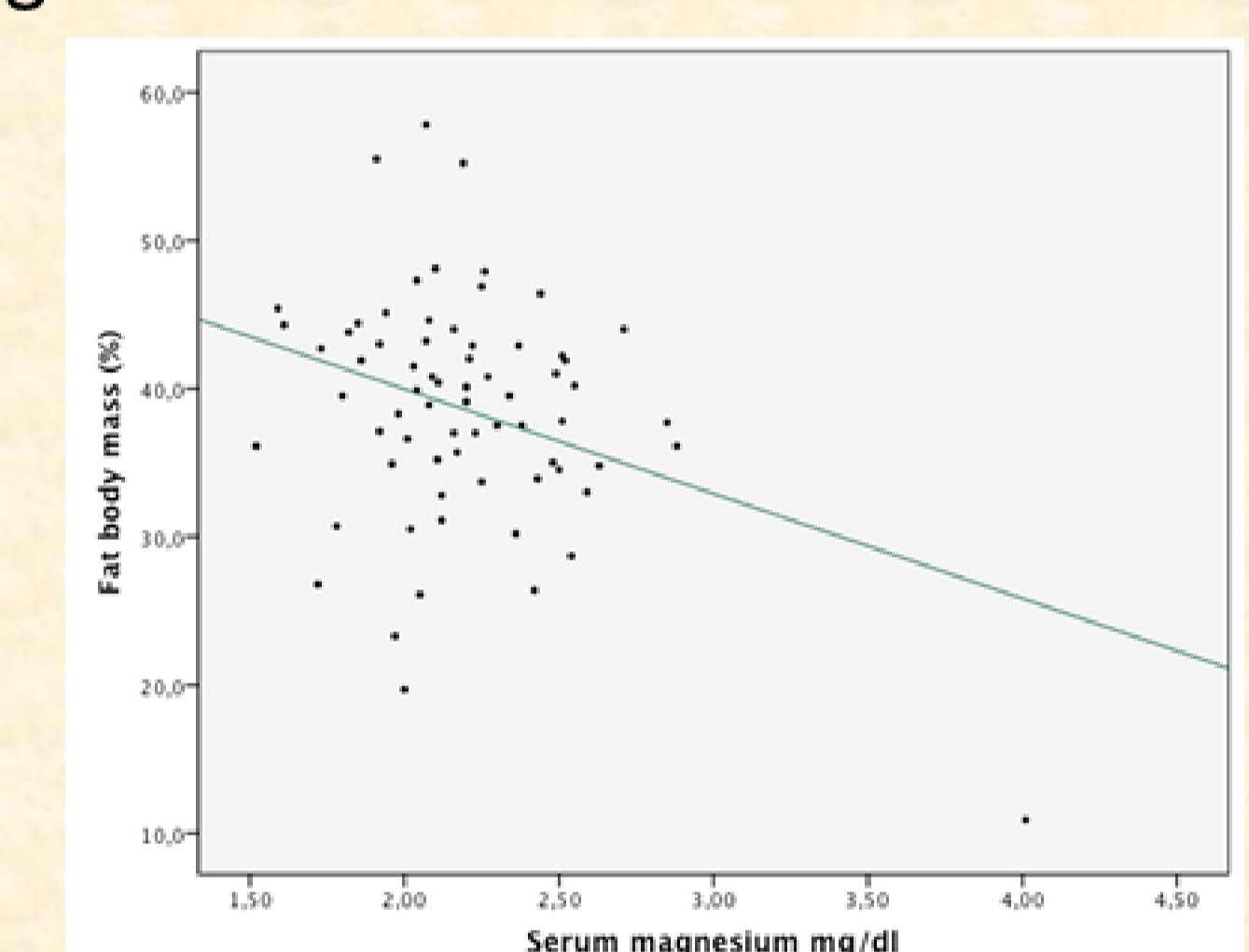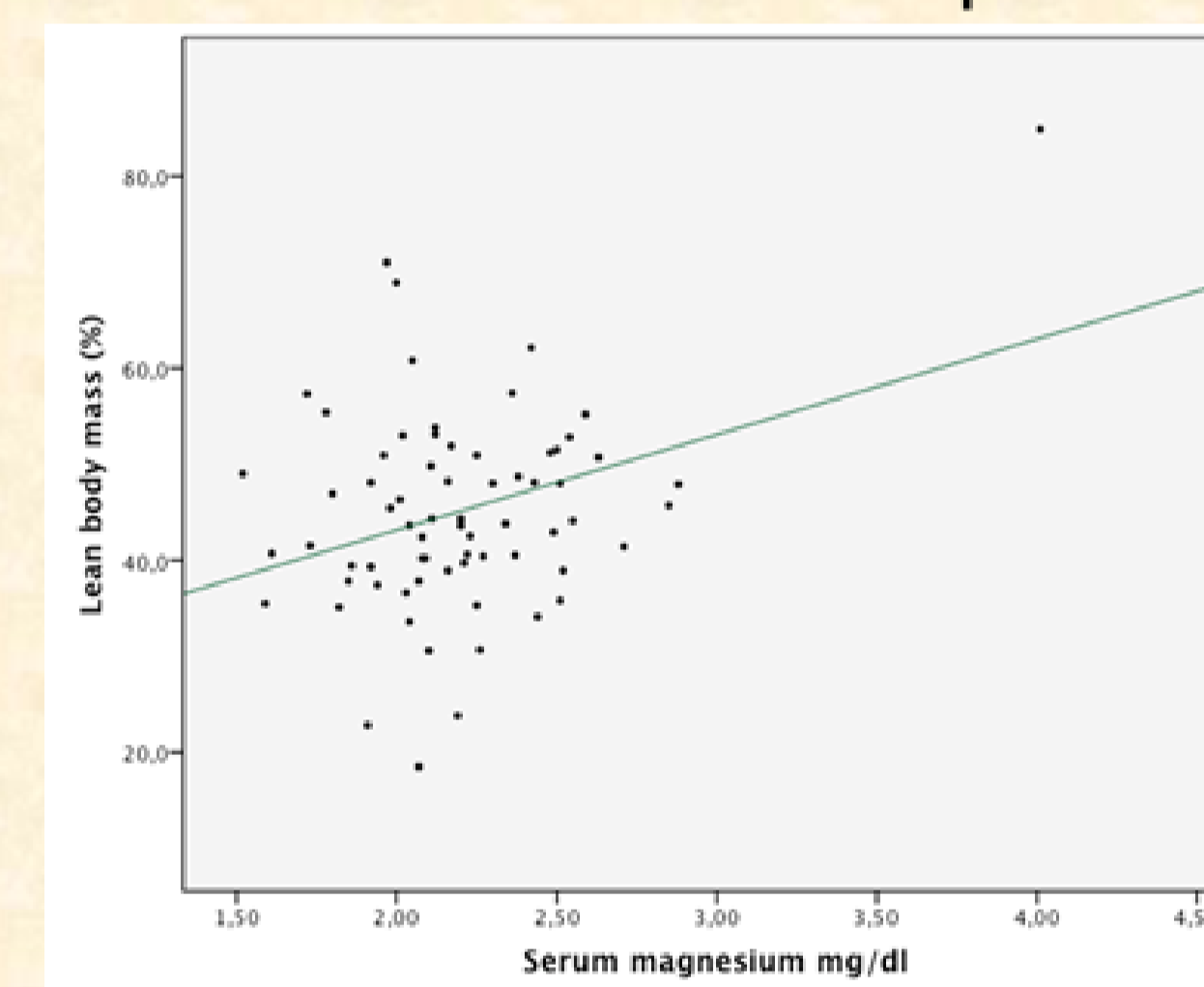
BIVARIATE CORRELATION BETWEEN S-Mg AND NTCV

GROUP 1.
There was no correlation between S-Mg and biochemical nutritional parameters

GROUP 2.
Regarding body composition, higher magnesium levels were related to more lean body mass (p=0,004) and less fat body mass (p=0,018). No relation was found with phase angle.


GROUP 3.
There was no correlation between s-Mg and adipokines.

GROUP 4.
In relation to inflammatory parameters, lower magnesium levels were associated with lower hemoglobin level (p=0,005) and more ESA resistance (p=0,05). Regarding CPR, a trend to higher CRP level in patients with lower mg was evident, however this was not statistically significant (p=0,097). There was no relation with neither lL-6 nor TNF-α.
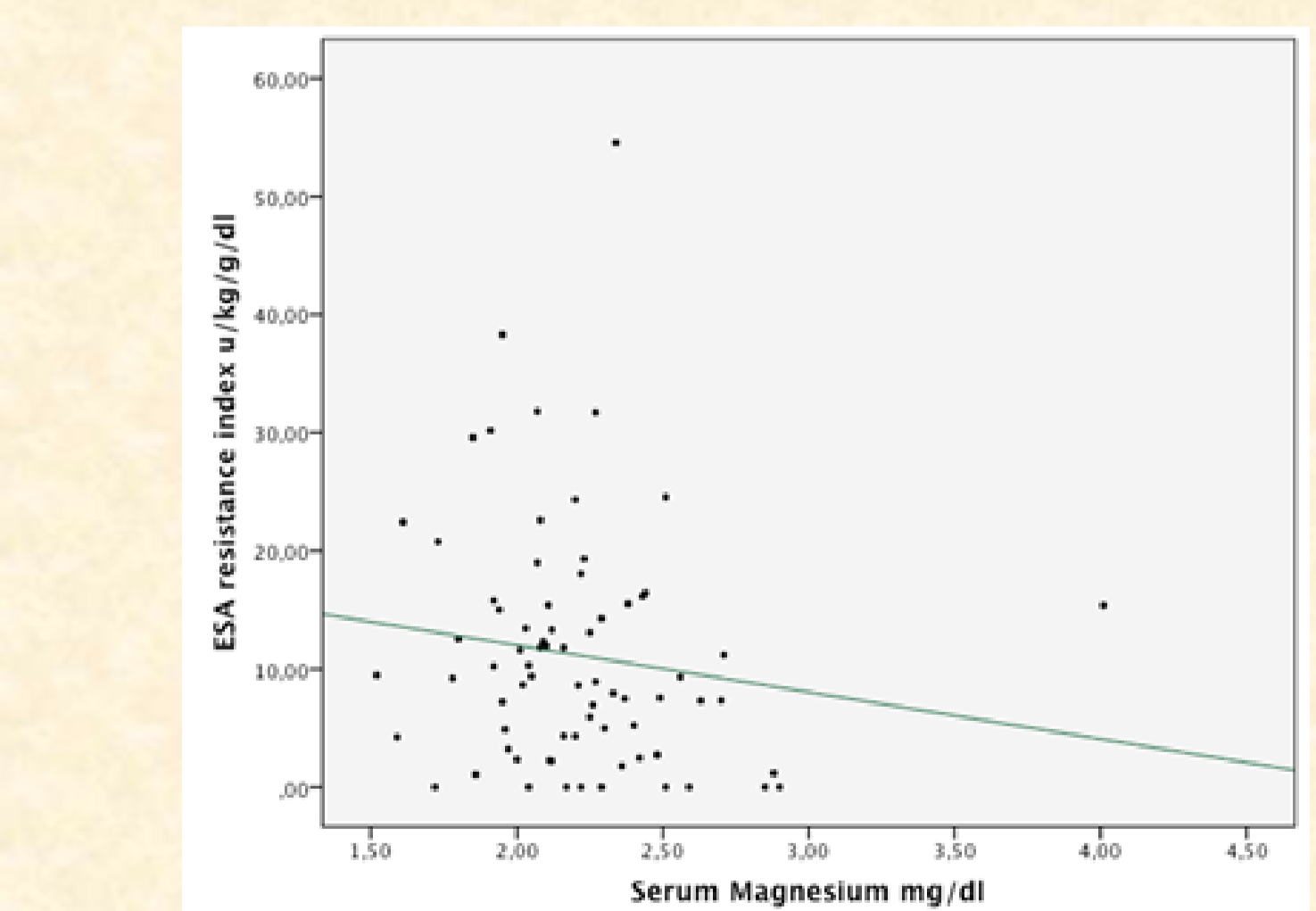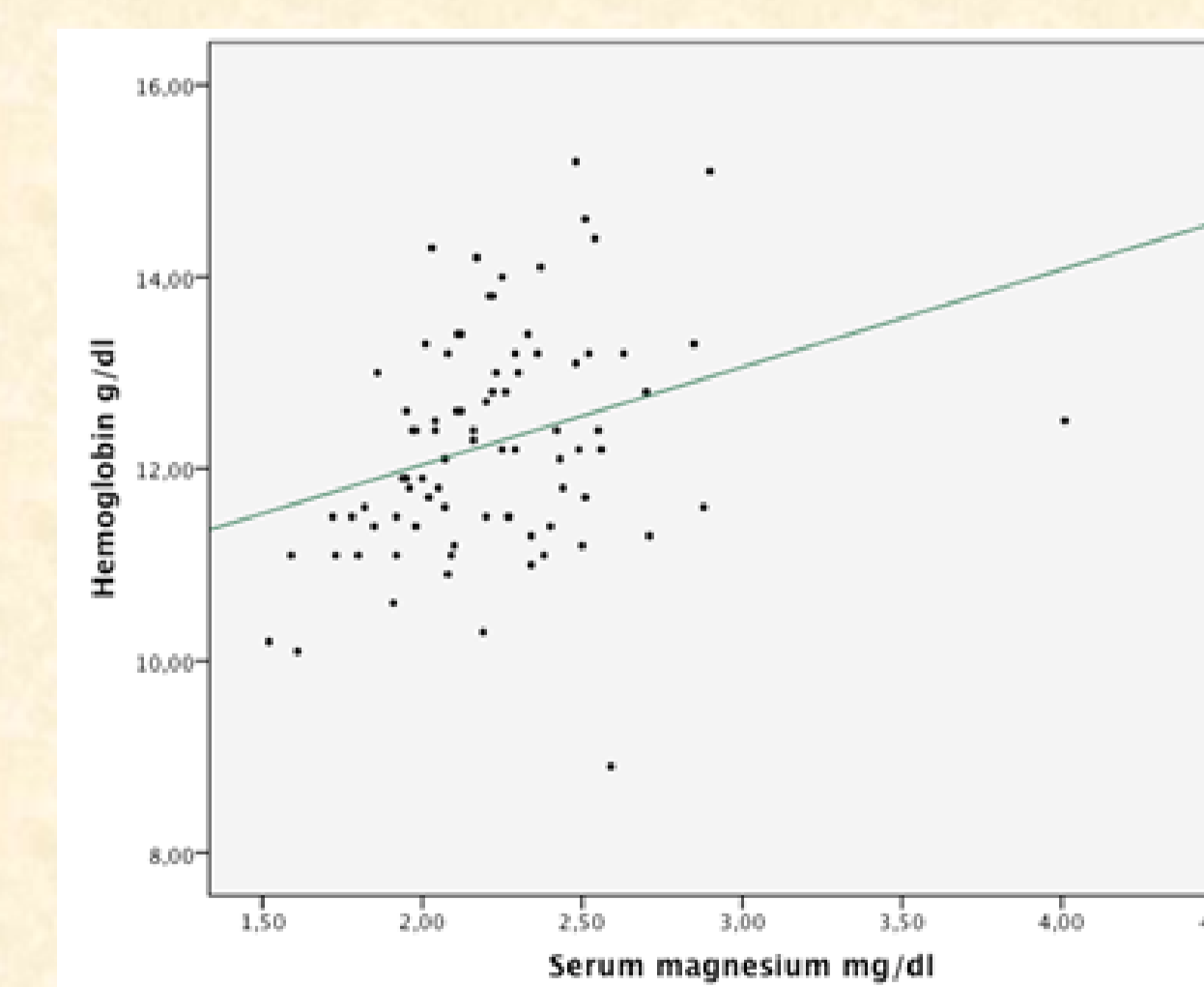
CONCLUSIONS

In our population, the incidence of hypomagnesemia is extremely low. However, lower serum magnesium was associated with some non-traditional cardiovascular risk factors like anemia and ESA resistance, and also with poor nutritional status (less lean body mass and high fat body mass). It seems that comorbidity and lean body mass are the more determinant factor associated with lower serum magnesium. Consistently, both of the mentioned factors could explain the higher mortality associated with low serum magnesium in hemodialysis patients.

REFERENCES:

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