

# RISK FACTORS AND PREVALENCE OF HYPOMAGNESEMIA IN KIDNEY TRANSPLANTATION



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## INTRODUCTION AND AIMS

Hypomagnesemia is frequently encountered in kidney transplant patients receiving calcineurin inhibitor (CNI)- based immunosuppression regimens. It has been associated with the development of new-onset diabetes after transplantation, and has been described as an independent risk factor for cardiovascular morbidity in the general population.

The aim of this study was to determine the prevalence of hypomagnesemia in a large kidney transplant cohort, analyze the associated risk factors and investigate on the effect of each factor on renal magnesium excretion.

## METHODS

We performed a cross-sectional study in 938 active kidney transplant patients at our center.

We collected their demographic features, comorbidities, type, dose and serum levels of immunosuppressants used, concomitant treatment, kidney function, serum levels of magnesium (Mg), calcium, phosphorus, PTH, 25-hydroxyvitamin D, 24-hour urinary magnesium excretion (24-H MgE) and fractional excretion of magnesium (FeMg).

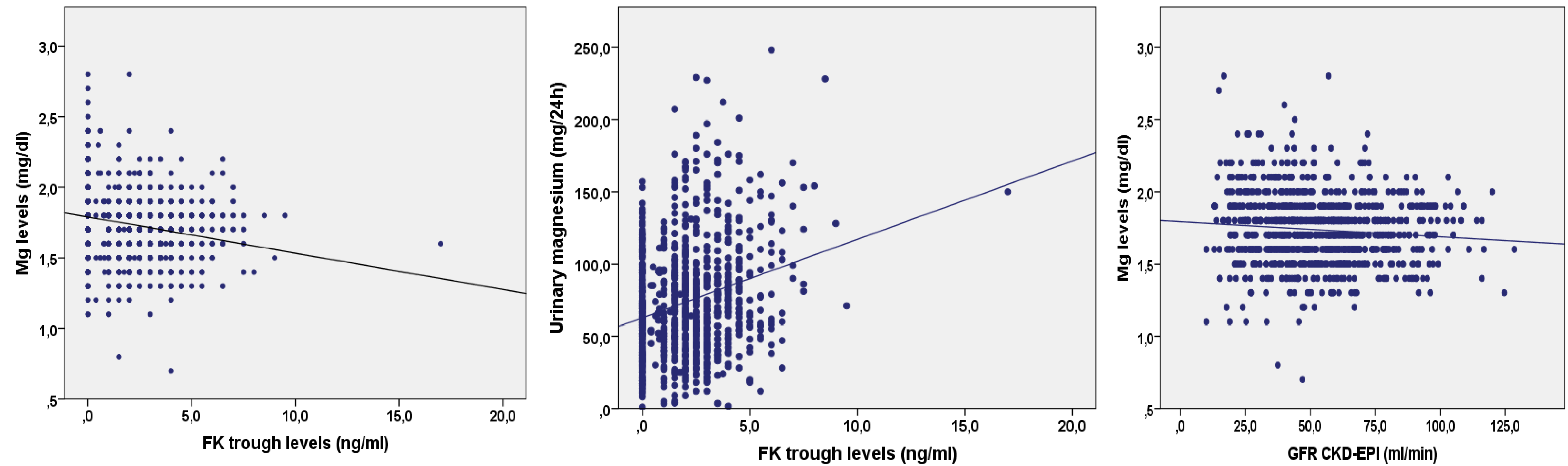
Hypomagnesemia was defined as having Mg levels of  $\leq 1,5$  mg/dl

## RESULTS

938 active kidney transplant recipients, 64.3% males, median age 60,1 (49.4-69.4) years old. Median Mg levels 1.70 mg/dl (IQR 1.60-1.90 mg/dl). 197 patients were found to have hypomagnesemia (Prevalence=21%)

There was a negative correlation between serum Mg levels and both tacrolimus trough levels ( $r = -0.291$ ,  $p < 0.001$ ) and eGFR measured by CKD-EPI ( $r = -0.095$ ,  $p = 0.003$ ). The negative correlation between tacrolimus levels and Mg levels was stronger in patients with GFR  $> 60$  ml/min ( $r = -0.385$ , CI95% -0,497 to -0,294) than in patients with GFR between 30 and 60 ml/min ( $r = -0,267$ , CI95% -0,371 to -0,196) and GFR below 30 ml/min ( $r = -0,167$ , CI95% -0,286 to 0,034).

There was a positive correlation between tacrolimus trough levels and both FeMg ( $r = 0.126$ ,  $p < 0.001$ ) and 24H MgE ( $r = 0.209$ ,  $p < 0.001$ ). This positive correlation was stronger in patients with GFR  $> 60$  ml/min ( $r = 0,267$  with FeMg,  $r = 0,213$  for 24H MgE, both  $p < 0,001$ ) than in patients with GFR between 30 and 60 ml/min ( $r = 0,171$  with FeMg,  $r = 0,189$  with 24H MgE,  $p < 0,001$ ). The correlation between tacrolimus levels and FeMg in patients with GFR  $< 30$  ml/min was significantly weaker ( $r = 0,03$ ,  $p > 0,05$ ).



Patients on treatment with mTOR inhibitors (mTORi) had significantly higher magnesium levels and lower FeMg (Mean Mg= 1.87 mg/dl  $\pm$  0.25 and Mean FeMg= 5.99%  $\pm$  3.38) than patients with CNI (Mean Mg=1.70 mg/dl  $\pm$  0.23 and Mean FeMg= 7.41%  $\pm$  4.54) ( $p < 0,001$ ) or combined CNI and mTORi (Mean Mg=1.74 mg/dl  $\pm$  0.23 and Mean FeMg= 7.73%  $\pm$  4.25) ( $p < 0,001$ ).

There were no differences between patients with CNI and those with combined CNI and mTORi.

There was an association between having an CNI-based treatment and the need for Mg supplements ( $p = 0,002$ ).

## CONCLUSIONS:

There is a high prevalence of hypomagnesemia in kidney transplant patients secondary to hypermagnesiuria, especially with higher glomerular filtration rates and higher tacrolimus trough levels.

Calcineurin inhibitors, proton pump inhibitors and cinacalcet act as independent risk factors for hypomagnesemia, especially in patients with higher glomerular filtration rates. Calcineurin inhibitors and cinacalcet are associated with higher urinary fractional excretion of magnesium, while proton pump inhibitors do not show an association with magnesium excretion.

### REFERENCES:

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In the multivariate regression analysis, hypomagnesemia showed a significant association with the use of CNI (OR= 2,36, CI95% 1,10-5,04), proton-pump inhibitors (OR=1,55, CI95% 1,09-2,20), and cinacalcet (OR=2,08, CI95% 1,37-3,16).

Variables	OR	95% CI	
		Inferior	Superior
DM	1,107	0,779	1,572
Diuretics	1,181	0,790	1,767
GFR (CKD-EPI)	1,009	1,001	1,017
<b>CNI</b>	<b>2,479</b>	<b>1,148</b>	<b>5,351</b>
<b>PPI</b>	<b>1,607</b>	<b>1,127</b>	<b>2,294</b>
<b>mTORi</b>	<b>0,711</b>	<b>0,397</b>	<b>1,273</b>
<b>Cinacalcet</b>	<b>2,229</b>	<b>1,458</b>	<b>3,408</b>
Paricalcitol	1,620	1,014	2,590