

Background

Hypomagnesaemia is common in diabetic patients particularly in those with poor control. It is unknown whether lower magnesium causes worse glycaemic control or poor control leads to hypomagnesaemia. One possibly mechanism for the latter may be a higher renal magnesium excretion in those patients due to decrease insulin-stimulated magnesium reabsorption.

The relationship between urinary magnesium and glycaemic control is not known. We aimed to study the association between urinary magnesium and glycaemic control in a type 1 diabetes (T1D) pediatric population.

Methods

Study of a pediatric population with T1D attending the Pediatric Endocrinology Clinic at Hospital São João, Porto, Portugal, between May 2014 and April 2015.

We prospectively included all patients with T1D with an urinary magnesium determination.

Urinary magnesium was measured in a first-morning-void urine sample.

Glycated haemoglobin (HbA1c) was measured in a capilar blood sample using DCA 2000 analyser.

Poor glycaemic control was defined as HbA1c >7.5%

Patients with good and poor glycaemic control were compared: χ^2 test (with Fisher correction when appropriated), independent samples t test and Mann-Whitney U test.

We studied the correlation between urinary magnesium and HbA1c using Spearman's rank correlation coefficient.

A multivariate logistic regression model was built to study predictors of poor glycaemic control.

Results

Table 1 – Patients' characteristics

	All (n=48)	Good control (n=12)	Poor control (n=36)	p
Age, years	12 4	12 3	12 4	0.63
Male sex, n (%)	28 (58.3)	6 (50.0)	22 (61.1)	0.52
T1D duration, months	88 43	93 43	85 43	0.43
HbA1c, %	8.4 1.4	7.0 0.4	8.9 1.3	<0.001
Continuous Subcutaneous Insulin Infusion (CSII), n (%)	14 (29.2)	7 (58.3)	7 (19.4)	0.02
Chronic autoimmune thyroiditis, n (%)	11 (22.9)	2 (16.7)	9 (25.0)	0.55
Retinopathy, n (%)	1 (2.1)	0 (0.0)	1 (2.8)	1.00
Nephropathy, n (%)	7 (14.6)	3 (25.0)	4 (11.1)	0.34
Haemoglobin, g/dL	14.2 1.4	13.8 1.1	14.3 1.4	0.21
Total Cholesterol, mg/dL	167 28	160 24	170 29	0.33
HDL, mg/dL	58 12	56 10	58 12	0.51
LDL, mg/dL	96 21	91 18	98 22	0.36
Triglycerides, mg/dL	62 21	66 19	61 21	0.52
Creatinine mg/dL	0.54 0.13	0.53 0.10	0.55 0.14	0.76
Ionized Calcium, mEq/L	2.56 0.08	2.54 0.08	2.57 0.08	0.24
Phosphate, mg/dL	4.27 0.62	4.48 0.54	4.23 0.64	0.43
Serum magnesium, mEq/L	1.53 0.10	1.54 0.09	1.53 0.11	0.91
Urinary magnesium, mEq/L	8.4 (5.3-12.3)	5.6 (3.1-7.7)	9.4 (6.8-12.4)	0.01
Microalbuminuria, mg/g creatinine	6.65 (2.70-10.98)	9 (3.8-12.7)	4.8 (2.7-9.5)	0.34

Table 2 – Correlation between urinary magnesium (UMg) and serum magnesium, glycaemic control and microalbuminuria

	HbA1c	T1D duration	Micro-albuminuria	Serum magnesium
UMg rho	0.30	-0.17	0.28	0.07
UMg p	0.04	0.26	0.05	0.65

Table 3 – Predictors of poor glycaemic control - Logistic regression multivariate model

	Odds Ratio (CI 95%)	p
Age, per year	0.95 (0.68-1.31)	0.75
T1D duration, per month	0.97 (0.94-1.00)	0.04
CSII	0.06 (0.008-0.45)	0.006
UMg, per mEq/L	1.40 (1.05-1.85)	0.02

Conclusions

Urinary magnesium is an independent predictor of poor glycaemic control.

Per each mEq/L increase of urinary magnesium there is a 40% higher risk of poor glycaemic control.