VITAMIN K_2 (MENAQUINONE) INTAKE AND ITS SERUM CONCENTRATION IN HAEMODIALYSIS PATIENTS

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OBJECTIVES

Menaquinone-4 (MK-4) deficiency seems to be an important risk factor of vascular calcification in haemodialysis (HD) patients with chronic kidney disease, by diminished levels of calcium metabolism regulatory proteins. Optimal daily vitamin K_1 and K_2 intake as well as serum MK-4 level reference value in HD have not been determined, yet.

METHODS

85 HD patients (51 males) and 22 apparently healthy subjects (9 males) with normal kidney function (control group) were enrolled into this study. Serum MK-4 concentration was measured by HPLC (sensitivity 0.055ng/mL) in addition to routine biochemical parameters. Daily vitamin K_1 and K_2, micro- and macronutrients as well as energy intake were assessed on the basis of tree day food diary completed by patients.

AIM

The aim of the present study is to asses assed serum MK-4 concentration in relation to daily vitamin K_1 and K_2 intake and their sources in HD patients.

RESULTS

Daily K_2 intake was significantly lower (by 29%) among HD patients, while K_1 consumption was similar in both groups. Daily K_2 intake in HD patients was significantly associated with fat and protein consumption (r=0.43, r=0.33, respectively). In HD serum MK-4 concentration was less frequently detectable (in 59% HD and 95% controls, p<0.001) and in those with detectable levels was lower than in the controls (by 42%). A correlation between serum MK-4 levels and mean daily K_2 consumption in HD patients (r=0.38) was weaker than in the controls (r=0.47). In multiple regression analysis the variability of serum MK-4 levels in HD patients were explained by daily K_2 intake (β=0.309).

	HD patients (N=71)	Control group (N=22)	Statistical significance
Daily energy intake (kcal/day)	2245 (2157-2333)	2639 (2418-2860)	<0.001
Daily energy intake (kcal/kg/day)	30.8 (28.9-32.6)	35.9 (31.8-40.1)	0.04
Energy from carbohydrates (%)	48,0 (45.1-49.2)	47.2 (42.9-51.4)	0.49
Energy from fat (%)	37.0 (35.4-38,5)	38,6 (33.5-43.8)	0.32
Energy from proteins (%)	15.0 (11.5-13.1)	14.2 (12.8-15.6)	0.36
Carbohydrates (g/day)	252 (240-264)	304 (267-342)	<0.001
Proteins (g/day)	80 (78-83)	90 (81-99)	0.02
Proteins (g/kg/day)	1.11 (1.04-1.18)	1.23 (1.06-1.40)	0.20
Fat (g/day)	88 (84-92)	109 (92-126)	0.004
Sodium (g/day)	2.86 (2.65-3.07)	3.05(2.84-3.27)	0.43
Potassium (mmol/day)	35.6 (33.7-37.4)	51.2(43.7-58.8)	<0.001
Calcium (mg/day)	600 (508-692)	1102 (1017-1187)	<0.001
Phosphorus (mg/day)	885 (833-938)	1444 (1305-1583)	<0.001
Phosphorus (mg/kg/day)	12.1 (11.3-13.1)	19.9 (17.1-22.7)	<0.001
Vitamin K_1 (µg/day)	98.8 (90.0-108.0)	106.3 (97.3-115.3)	0.49
Vitamin K_2 (µg/day)	28.5 (26.2-30.8)	34.2 (30.3-38.0)	<0.05

Table 1. Macro- and micronutrients, including K_1, K_2 vitamins intake in study participants (mean & 95% CI).

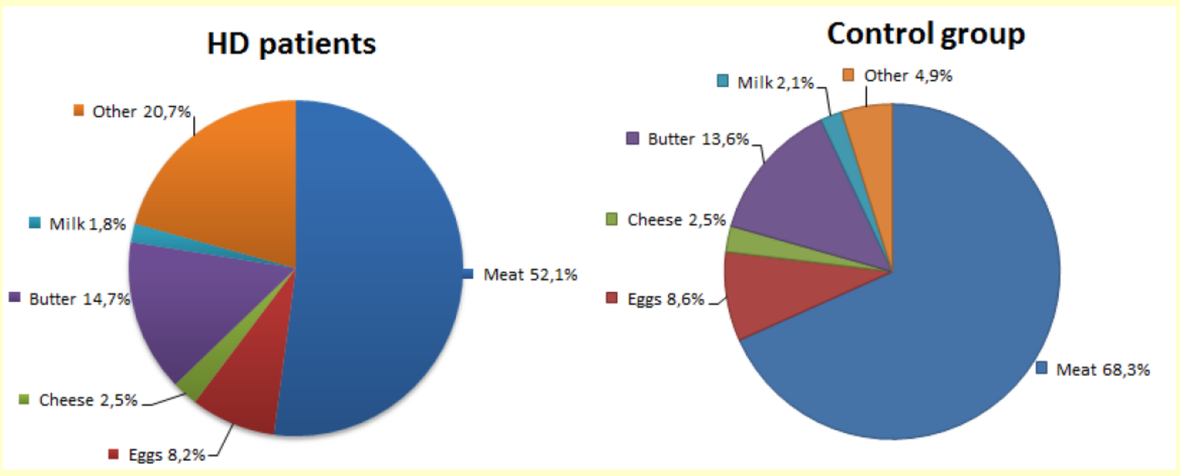

Figure 2. The main dietary sources of K_2 in HD patients.

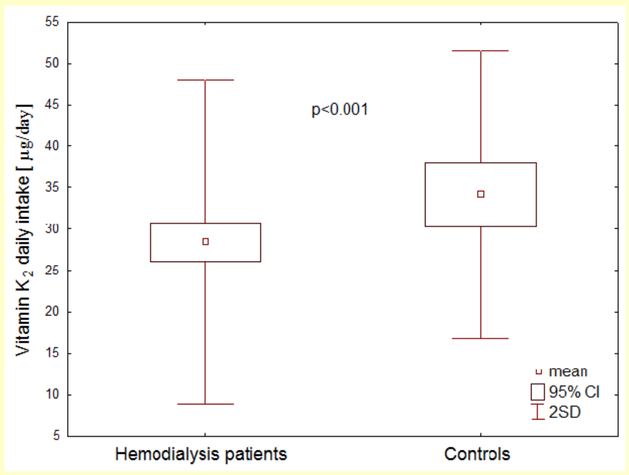

Figure 1. Daily vitamin K_2 intake in hemodialysis patients and healthy controls.

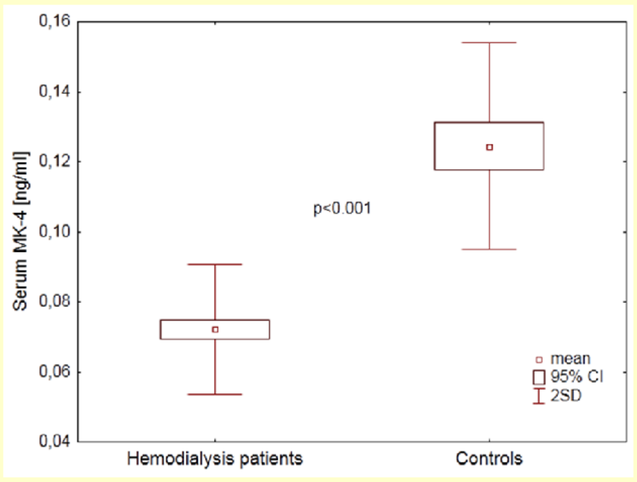

Figure 3: Serum MK-4 levels in hemodialysis patients (with detectable levels) and healthy controls.

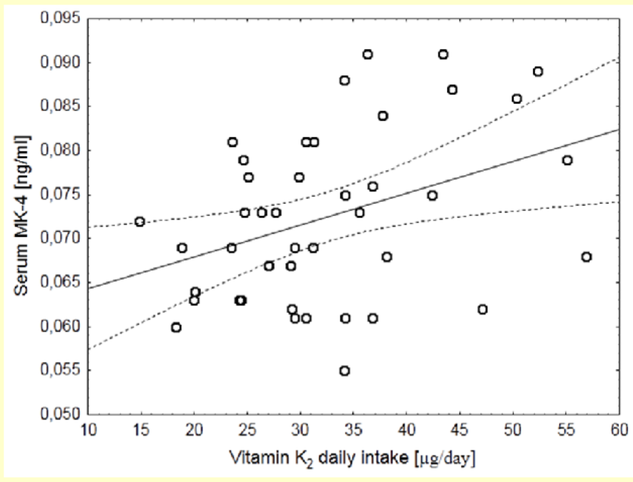

Figure 4: Correlation between daily vitamin K_2 intake and serum MK-4 levels.

CONCLUSIONS

Low vitamin K_2 consumption, mainly due to intake restrictions of meat, recommended for low phosphorous diet, is the most important cause of decreased serum MK-4 concentrations in HD patients.

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