

Nutrients intake assessed with Diet History Questionnaire II in relations to the long-term calcium-phosphate control in hemodialysis patients with end-stage renal failure

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OBJECTIVES

Introduction: Diet is a key factor that determines proper alignment of calcium-phosphate and nutritional status among haemodialysis (HD) patients. The aim of the study was to assess the nutrients intake in relation to the long-term calcium-phosphate control in haemodialysis (HD) patients with end-stage renal failure.

METHODS

Material and Methods: The study included 107 patients (66 men) from 10 dialysis centers in Silesia region of Poland. To analyze diet composition during a prior year, with portion size version of Diet History Questionnaire II from National Institutes of Health was used. Poor long-term alignment of calcium-phosphate homeostasis was defined as presence of over 50% monthly phosphorus concentrations that exceeded 5 mg/dL and for calcium 10.2 mg/dL.

RESULTS

Results: Lower than recommended protein intake was found in 63% of HD patients (average consumption of 0.9 ± 0.5 g/kg/d). Most of the patients consumed too much fat ($33.5 \pm 6.7\%$ of energy) and sodium (2912 ± 1542 mg/d). In 42% of patients dietary phosphorus intake was consistent with the recommendations (13.3 ± 7.5 mg/kg/day). Protein intake over 1.2 g/kg/d resulted in an increased consumption of phosphorus, but did not increase the risk of misalignment of phosphorus concentrations - OR = 1.15 (0.40-3.27); p = 0.8. Poor control of serum phosphorus concentrations was observed in 69% of patients (they were in average 8 years younger). The average intake of protein and phosphate in the group with good or not satisfactory serum phosphorus alignment did not differ significantly.

Table 1. Patients characteristics¹, mean \pm SD (group A – patients with less than 50% monthly phosphorous levels ≥ 5 mg/dL, group B – patients with $\geq 50\%$ monthly phosphorous levels ≥ 5 mg/dL)

	All patients (n=107)	Group A (n=33)	Group B (n=74)	p
Gender (male/female)	66/41	19/14	47/27	NS
Age (years)	61.9 \pm 14.8	67.4 \pm 12.5	59.4 \pm 15.2	p<0.01
Body mass (kg)	73.0 \pm 15.0	74.8 \pm 14.1	72.5 \pm 15.4	NS
Height (m)	1.68 \pm 0.08	1.69 \pm 0.07	1.67 \pm 0.09	NS
BMI (kg/m ²)	26.1 \pm 4.8	26.3 \pm 4.4	26.0 \pm 5.0	NS
underweight (n, %)	2; 1.9	0	2; 2.7	
normal weight (n, %)	46; 43.0	14; 42.4	32; 43.2	
overweight (n, %)	38; 35.5	12; 36.4	26; 35.1	
obesity (n, %)	21; 19.6	7; 21.1	14; 18.8	
I grade of obesity (n, %)	15; 14.0	6; 18.2	9; 12.2	
II grade of obesity (n, %)	6; 5.6	1; 3.0	5; 6.8	
Time on dialysis (months)	53 \pm 52	35 \pm 32	61 \pm 58	p<0.01
Kidney transplantation (n)	9	0	9	
Renal failure cause				
Diabetes (n)	31	10	21	
Hypertension (n)	12	6	6	
Nephrolithiasis (n)	6	4	2	
Glomerulonephritis (n)	15	2	14	
Interstitial nephritis (n)	6	0	4	
ADPKD (n)	9	2	7	
Vasculitis (n)	3	1	2	
Ischaemia (n)	2	1	1	
Other or unknown (n)	23	7	16	
Co-morbidities				
Hypertension (n, %)	99; 92.5	33; 100	66; 89.2	NS
Ischemic heart disease (n, %)	57; 53.3	24; 72.7	33; 44.6	p<0.01
Myocardial infarction (n, %)	20; 18.7	8; 24.2	12; 16.2	NS
Stroke (n, %)	6; 5.6	3; 9.1	3; 4.1	NS
Diabetes (n, %)	40; 37.4	14; 42.4	26; 35.1	NS
Hypercholesterolemia (n, %)	25; 23.4	10; 30.3	15; 20.3	NS
Parathyroidectomy (n, %)	6; 5.6	2; 6.1	4; 5.4	NS
Cancer (n, %)	17; 15.9	6; 18.2	11; 14.9	NS
PCI (n, %)	9; 8.4	1; 3.0	8; 10.8	NS
CABG (n, %)	7; 6.5	4; 12.1	3; 4.1	NS
Dialysis parameters				
Vascular access				
Arterio-venous fistula (n, %)	75; 70.0	22; 66.7	53; 71.6	NS
Central venous catheter (n, %)	32; 29.9	11; 33.3	21; 28.4	NS
Dialysis session duration (h)	3.8 \pm 0.4	3.8 \pm 0.5	3.8 \pm 0.4	NS
Ultrafiltration (l)	2.5 \pm 0.9	2.2 \pm 1.0	2.6 \pm 0.8	p<0.05
Residual diuresis (ml)	492 \pm 534	597 \pm 535	446 \pm 531	NS
Pharmacotherapy				
Iron (mg/day)	33 \pm 40	35.6 \pm 41.5	32.1 \pm 39.6	NS
Calcium carbonate (g/d)	3.3 \pm 2.7	3.5 \pm 2.5	3.3 \pm 2.8	NS
Alfadiol (n, %)	36; 33.6	9; 27.3	27; 36.5	NS
Cinacalcet (n, %)	15; 14.0	1; 3.0	12; 16.2	NS
Sevelamer (n, %)	3; 2.8	0	3; 4.1	NS
Biochemical parameters				
Phosphorus (mg/dl)	5.8 \pm 1.5	4.3 \pm 0.5	6.5 \pm 1.3	p<0.001

Table 2. Energy, macro- and micro-nutrients intake in 107 haemodialysis patients diet in comparison to K/DOQI recommendations

	% of patients		
	Below recommended level	According to recommendation	Over recommended level
Protein intake ^a	62.6	17.8	19.6
Energy intake	82.8	9.5	7.6
Fat intake (% of daily energy) ^b	10.3	16.8	72.9
Carbohydrates intake (% of daily energy) ^c	24.3	74.7	0.9
Fiber intake	81.3	13.0	5.6
Sodium	3.7	26.1	70.0
Potassium	65.4	10.3	24.3
Phosphorous	34.6	42.0	23.4
Calcium	0	18.6	81.4
Magnesium	46.7	35.5	17.7

a refers to 1.0-1.2 g/kg body mass/day
b refers to 25-30% of daily energy intake
c refers to 45-75% of daily energy intake

Table 3. Energy, macro- and micronutrients intake in HD patients with good and bad phosphorus alignment

	Group A (n=33)	Group B (n=74)	p
Protein intake (g/kg body mass/day)	0.9 \pm 0.4	0.9 \pm 0.6	NS
Energy intake (kcal/kg body mass/day)	23.8 \pm 12.4	22.2 \pm 12.5	NS
Fat intake (% of daily energy)	34.6 \pm 6.0	33.1 \pm 7.0	NS
Carbohydrates intake (% of daily energy)	50.6 \pm 7.2	51.4 \pm 9.2	NS
Dietary fiber intake (g/day)	16.5 \pm 8.9	13.1 \pm 6.0	p=0.06
Sodium intake (mg/day)	3189 \pm 1619	2789 \pm 1501	NS
Potassium intake (mEq/day)	68.5 \pm 34.6	59.6 \pm 33.4	NS
Phosphorous intake (mg/kg body mass/day)	13.8 \pm 7.0	13.1 \pm 7.7	NS
Calcium intake (mg/day)	4102 \pm 2454	3809 \pm 2850	NS

Table 4. Phosphorus alignment according to protein and phosphorous intake (group A – patients with less than 50% monthly phosphorous levels ≥ 5 mg/dL, group B – patients with $\geq 50\%$ monthly phosphorous levels ≥ 5 mg/dL)

