

End-Stage Renal Disease: Nutritional Considerations

Nutrition-related concerns include maintenance of acceptable weight and serum proteins (eg, albumin), prevention of renal osteodystrophy, and reduction of cardiovascular risk.

Weight Maintenance and Protein Requirements

Protein needs are higher in patients with ESRD due to losses that occur during dialysis. The recommended dietary protein intake for clinically stable maintenance hemodialysis patients is 1.2 g/kg body weight/d, and 1.2 -1.3 g/kg body weight/d for individuals on peritoneal dialysis, 50% of which should come from sources high in biological value.⁹

Nutritional status should be assessed, and every patient with ESRD should receive a diet plan. ESRD patients on dialysis may spontaneously reduce protein and calorie intake as a result of uremic toxins, elevations in leptin and other cytokines, and delayed gastric emptying.¹⁰ The average energy intake of patients with ESRD is lower than the recommended 30 to 35 kcal/kg,¹¹ and 50% of patients reveal evidence of malnutrition.¹²

To prevent malnutrition-related morbidity and mortality, ESRD patients on dialysis should have periodic nutrition screening, consisting of laboratory measures (eg, albumin), comparison of initial weight with both usual body weight and percent of ideal body weight, subjective global assessment, and dietary interviews with review of food diaries. Nutrition counseling should be intensive initially and provided every 1 or 2 months thereafter. If nutrient intake appears inadequate, malnutrition is apparent, or adverse events or illnesses threaten nutritional status, counseling should be increased. If protein-calorie needs cannot be met with the usual diet, patients should be offered dietary supplements or, if necessary, tube feeding or parenteral nutrition to approximate protein and calorie requirements.⁹

Sodium and Potassium Balance

ESRD patients should avoid high-sodium diets. Hypertension in dialysis patients is largely attributed to positive sodium balance and volume expansion.¹³ While many patients on dialysis can effectively control blood pressure without drugs on a low-sodium (2 g) diet and a low-sodium (130 mmol) dialysate,¹⁴ current practice is such that almost 70% of dialysis patients require antihypertensive medications. Although many patients may not achieve a therapeutic degree of sodium restriction, those who do can effectively control blood pressure and reverse left ventricular hypertrophy.¹⁵

A high-potassium diet is normally desirable to control blood pressure and reduce risk for stroke; however, individuals with ESRD on hemodialysis cannot tolerate this diet because they are unable to excrete potassium. Therefore, ESRD patients may need to avoid such foods as bananas, melon, legumes, potatoes, tomatoes, pumpkin, winter squash, sweet potato, spinach, orange juice, milk, and bran cereal to prevent life-threatening hyperkalemia-induced arrhythmia. Evidence indicates that the vast majority of patients comply with potassium restriction.¹ In patients on peritoneal dialysis, hyperkalemia is significantly less likely and hypokalemia has been reported in some patients, at times requiring an increase in potassium-containing foods and even potassium supplementation.

Fluid Restriction

It is essential that ESRD patients restrict their fluid intake. Without adherence to a specified fluid allowance, patients are more likely to have poorly controlled blood pressure¹⁷ and risk congestive heart failure. The typical fluid allowance for patients on dialysis is 700 to 1000 mL/day, plus urine output.

Phosphorus

Elevated blood phosphorus concentrations are associated with increased mortality in ESRD patients,¹² and increase the risk for cardiovascular events, at least in part by contributing to vascular calcification.¹⁸ Excess phosphorus also causes secondary hyperparathyroidism, triggering the release of calcium from the bone matrix, and osteodystrophy.¹² Management of hyperphosphatemia and renal osteodystrophy has improved with phosphate binders, particularly sevelamer hydrochloride (Renagel), which also helps prevent hypercalcemia-related vascular calcification.¹⁹ However, certain factors continue to confound adequate control of phosphorus levels. These include covert phosphate intake from processed foods, ²⁰ treatment with high doses of vitamin D analogues, and the high protein needs of ESRD patients. Protein intake over 50 grams/day causes positive phosphate balance, in spite of phosphate binder therapy.^{12, 21}

Micronutrient Supplements

Micronutrient supplements are essential for ESRD patients. Individuals on dialysis commonly suffer from deficiencies of vitamin C, folate, vitamin B6, calcium, vitamin D, iron, zinc, and possibly selenium, which can contribute to an antioxidant-deficient state.²² The National Kidney Foundation clinical practice guidelines for nutrition in chronic renal failure suggest that patients achieve 100% of the Dietary Reference Intakes (DRI) for vitamins A, C, E, K, thiamin (B1), riboflavin (B2), pyridoxine (B6), vitamin B12, and folic acid, as well as 100% of the DRI for copper and zinc.⁹ As a result of restricted intake of many foods and losses of water-soluble vitamins during dialysis, patients are usually given specially formulated vitamins. Intravenous forms of vitamin D analogues and iron are typically given to patients. While oral iron supplements may not be needed, oral vitamin D (ergocalciferol) may be beneficial.

Certain other dietary supplements may be helpful. Supplementation with L-carnitine has been approved by the U.S. Food and Drug Administration to treat carnitine depletion in dialysis patients. In small studies L-carnitine has also been found to improve lipid metabolism, protein nutrition, antioxidant status, and anemia.²³ However, some large studies have not confirmed these findings. Therefore, inadequate evidence exists to support the routine use of carnitine in patients who do not reveal signs of deficiency.²⁴ Both vitamin C (250 mg/d) and vitamin E (400 IU/d) have proven effective in some patients for treating painful muscle cramps, and they provide a less toxic alternative to quinine therapy.^{25, 26} However, additional clinical trials are required before these can be used as standard therapy.

Saturated Fat and Cholesterol

Dialysis patients should follow a diet low in saturated fat and cholesterol. These patients are considered the group at greatest risk for development of coronary artery disease. They often have increases in serum triglycerides and low high-density lipoprotein (HDL) cholesterol.²⁷ although they must eat a relatively high-calorie diet to spare protein, patients on dialysis should avoid foods that raise triglycerides and cholesterol concentrations (see Hyperlipidemia).

Orders

2-gram sodium, 2-gram potassium, phosphate-restricted diet, low in saturated fat and cholesterol.

Nutrition Consultation: To assess calorie and protein requirements, and instruct patient in above dietary recommendations.

B-complex with small doses of vitamin C, 1 tablet daily by mouth. Consider supplemental ergocalciferol or cholecalciferol.

What to Tell the Family

End-stage renal disease is often preventable with the proper control of blood pressure, blood lipids, and blood glucose, in combination with appropriate medications. For patients who have progressed to the need for dialysis, morbidity and mortality can be reduced and quality of life enhanced through adherence to an appropriate dietary and medical regimen, along with regular physical activity.