Nutrition and growth in kidney disease

CARI guidelines

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The Caring for Australasians with Renal Impairment (CARI) guidelines initiative is an Australia/New Zealand evidence based project that aims to provide high quality, evidence based clinical practice guidelines for the management of all stages of kidney disease. This article summarises CARI guidelines on *Nutrition and growth in kidney disease* and forms part of a series of articles on aspects of management of patients with chronic kidney disease. Complete CARI guideline detail is available at www.cari.org.au.

Data sources

Medline, Embase, Cochrane Clinical Trials Database.

Study selection and assessment

High level evidence (ie. systematic reviews of randomised controlled trials [RCTs] or standard RCT studies) were available for the guidelines. Recommendations were also developed using evidence from observational studies such as cohort, case control and case series studies.

Minerals in adult predialysis patients

Agents containing aluminium should be used with caution (Level II evidence – RCT).

Protein intake in children

Children with chronic kidney disease (CKD) should have a protein intake equivalent to or above the Food and Agriculture Organisation/World Health Organisation/United Nations University (FAO/WHO/UNU) recommendations for healthy children (Level II evidence – RCT).

rhGH treatment in children

Recombinant human growth hormone (rhGH) therapy should be offered to short children (height <25th percentile for chronological age, height velocity <25th percentile for bone age) with CKD or end stage kidney disease (ESKD) (Level I evidence – systematic review). rhGH therapy is less effective when children are on dialysis or post-transplant and should therefore be considered in younger children and infants (who satisfy the criteria for rhGH therapy) before growth failure is severe (Level I evidence – systematic review). The recommended rhGH dosage is 28 IU/m^2/week given subcutaneously on at least 6 days per week (Level II evidence – RCT).

Suggestions for clinical care in adult predialysis patients

Energy intake

Ideal caloric energy intake determined for age, gender, body mass index (BMI), and level of physical activity. To avoid protein malnutrition or undesired weight loss, the recommended energy intake is 35 kCal/kg ideal body weight (IBW) per day. Early referral to a renal dietician is recommended.

Carbohydrates

Aim to avoid protein energy malnutrition; reduce fat intake to less than 30% of daily energy intake with saturated component ≥10%. Carbohydrates should be used to make up the balance of the required daily energy intake.

Protein

For patients with progressive CKD on a protein restricted diet, protein intake should be ≥0.75 g/kg IBW per day. The protein should be ≥50% high biological value. An energy intake of ≥35 kCal/kg IBW per day to minimise protein energy malnutrition must accompany a low protein diet. Plasma acidosis must be corrected before commencing a lower protein diet.

Lipids/fats

Chronic kidney disease patients should have regular checks of serum cholesterol and triglycerides and blood cholesterol targets should be similar to guidelines for the nonrenal disease population. Cholesterol lowering therapy should be commenced in patients who have failed to attain a serum cholesterol <4.5 mmol/L with dietary manipulation. HMG CoA reductase inhibitors (statins) are the choice for HDL and/or LDL.

Fluid and electrolytes

Sodium

Hypertensive patients should limit sodium intake to <100 mmol/day. Early use of diuretics may be required. People with salt losing nephropathy may have high obligatory sodium loss therefore sodium restriction may be harmful. Acidosis correction therapy will increase the daily sodium intake and this needs to be accounted for in dietary advice given to the patient.

Potassium

Regular monitoring and reduced potassium diet should commence when serum potassium is >5.5 mmol/L. When hyperkalaemia develops, one or more of the following should be looked for and if possible, corrected: oliguria, hypoaldosteronism, metabolic acidosis, medications such as angiotensin converting enzyme inhibitors (ACEI), corticosteroids, and potassium sparing diuretics in hypertensive patients.

Water/fluid

Adjust according to clinical state taking into account the degree of reduced glomerular filtration rate (GFR), oedema, and hypertension management. Increase fluid intake in patients with nephrolithiasis, urinary tract infections or salt losing nephropathy. Reduce fluid intake to reduce load on myocardium, reduce risk of pulmonary oedema, increase control of hypertension, improve oedematous states and decrease the use of diuretics.

Acidosis

Oral sodium bicarbonate should be administered to maintain serum bicarbonate >22 mmol/L in a total daily dose of 0.5–1.0 mmol/kg body weight per day, in divided doses 2–3 times per day. Correction of metabolic acidosis in severe renal failure is desirable to minimise skeletal muscle breakdown and associated negative nitrogen balance.

Minerals

Copper – no recommendation for routine measurement; zinc – regular monitoring; selenium – regular monitoring recommended for patients following a protein restricted diet; aluminium – measure in patients who have symptoms or signs of aluminium overload, those who have a laboratory test confirmation or on aluminium phosphate binders; other trace elements or minerals – clinical significance unknown.

Vitamins

Patients on protein restricted diets should receive supplementation with:

- thiamine (>1 mg/day)
- vitamin B2 (1–2 mg/day), and
- vitamin B6 (1.5–2.0 mg/day).

Patients with GFR <50 mL/min and with an elevated parathyroid hormone (PTH) level or histologically proven osteodystrophy should receive vitamin D supplementation.

Complementary medicines

Use of renally toxic agents should be advised against. Close monitoring should be undertaken if patients continue their use of the agent/s.

Suggestions for clinical care in children

Evaluation and management of nutrition

Measurements to be made at 1–3 month intervals of supine length or standing height and weight with comparison to normal values for chronological age using percentile charts, height standard deviation score (SDS) and BMI. Nutrition assessment and counselling by a paediatric renal dietician should take place at 1–3 month intervals. Protein equivalent of nitrogen appearance (nPNA) is not a reliable measure of dietary protein intake in children and should not replace nutritional assessment.

Energy intake

Energy intake should be equal to the recommended energy intake of healthy children of the same chronological age to allow for catch up growth. If energy intake cannot be maintained consistently, use nasogastric or gastrostomy feeds.

Protein intake

Children on peritoneal dialysis may require a protein intake of 144% of WHO recommendations and an energy intake of 89% of the recommended energy intake for height and age to achieve a nitrogen balance of 50 mg/kg/day.

Sodium chloride and water

Supplements of 4–7 mmol/kg/day of sodium chloride may be required to maximise growth in CKD and renal dysplasia. It should be given to the limit of tolerance as indicated by raised blood pressure.

Vitamins

Supplements of water soluble vitamins are indicated in dialysis patients who are not receiving nutritional supplements. Supplements of vitamins A, B12 and E are not indicated.

Anaemia

Correction of anaemia is indicated to improve quality of life and cardiovascular performance.

Metabolic acidosis

Should be corrected to achieve serum bicarbonate levels >22 mmol/L.

Bone disease

Regular monitoring for renal osteodystrophy is recommended, and treatment with vitamin D if this develops. Calcitriol and synthetic analogues are suitable.

Dialysis adequacy

Delivered doses of dialysis for children for both peritoneal and haemodialysis should at least equal doses recommended for adult patients.

rhGH treatment

Treatment with rhGH is initiated by the paediatric nephrologist in consultation with a paediatric endocrinologist. Treatment should not be considered until correction of nutritional deficiency, metabolic acidosis, anaemia, renal osteodystrophy and electrolyte disturbances have been achieved. Linear growth should be measured 6 monthly for at least 12 months to determine eligibility. A target height (50th percentile for mid-parental height) should be determined at the commencement of treatment. When the target height is reached, rhGH should be discontinued and recommenced if there is a subsequent decline in height SDS. If there is no response to rhGH for 12 months, as indicated by a negative gain in height SDS, consideration should be given to ceasing therapy. Reasons for treatment failure such as inadequate nutrition, metabolic acidosis and renal bone disease should be sought.

Conflict of interest: none declared.

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