

Review Article

Medical Nutrition Therapy in Chronic Kidney Disease

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Abstract

Nutritional disturbances in Chronic Kidney Disease are quite common but often both under nutrition as well as over nutrition goes unnoticed and undiagnosed. In Chronic Kidney Disease (CKD). Medical Nutrition Therapy(MNT) has certain advantages in terms of improvement in the level of biomarkers and a reduction in the rapid progression of the disease in patients who are on conservative therapy as well as on dialysis .This positively helps in reducing complications so that the need for long term dialysis can be modified .Initially nutritional variations are screened and accordingly guidelines are formulated regarding daily recommended dietary intake of macronutrients and micronutrients. Apart from other therapies Medical Nutrition Therapy remains an efficient tool in the overall management of Chronic Kidney Disease.

Key Words: Chronic Kidney Disease (CKD), Medical Nutrition Therapy (MNT), malnutrition, RRT (Renal replacement therapy)

Introduction

There are multiple factors that contribute to the etiology and development of CKD.¹ In spite of treatment with regular medications and renal replacement therapy the disease progression and response are variable.² Medical Nutrition Therapy which when appropriately practiced along with regular counseling ensures a healthy life to the patients. The nutritional needs of CKD patients are individually addressed and sorted out according to their needs which may create a distinct change in the disease process. Malnutrition is most frequently associated in patients with CKD.³ Malnutrition will mask the inflammatory changes that occur in a patient with CKD and so the disease morbidity diversifies.⁴ Hence Medical Nutrition Therapy proves to be the soul game changer. In this review article a clear image on current recommendations for screening of nutritional disturbances, its diagnosis, interventions, nutritional counseling and life style modifications are discussed. Medical Nutrition Therapy (MNT) is a complicated, multifaceted, nutritional prescription with promising results which requires to be initiated at least 12 months before expecting RRT.⁵

Etiological factors for malnutrition in CKD:

Three types of malnutrition exist in CKD namely uremic malnutrition, protein energy malnutrition, malnutrition – inflammation complex syndrome. Factors contributing to malnutrition are inadequate intake, anorexia due to impaired taste sensation and decreased olfactory function. Nutritional losses may be there in patients undergoing dialysis.

Approximately 8-12 g of amino acids are lost in one sitting of haemodialysis and 5-10 g of amino acids are lost per peritoneal dialysis. Use of bio incompatible dialysis membranes leads to increased degradation of proteins through ubiquitin - proteosome pathway. Medications, sarcopenia, autonomic gastroparesis, increased protein catabolism are the other factors that may contribute to malnutrition.

Domains Of Medical Nutrition Therapy:

Medical Nutrition Therapy takes into account the following aspects¹

- 1) Evaluation of protein energy nutritional status.
- 2) Management of serum electrolyte levels such as bicarbonate, potassium, sodium & other minerals like calcium, iron, phosphorous levels.
- 3) Recommended dietary intake (RDI) of protein, energy in terms of kilocalories, vitamins, minerals & other micronutrients.
- 4) Nutritional counseling.
- 5) Physical activity.

Screening tools for Under nutrition:

Medical Nutrition Therapy takes into account the following aspects¹

a) Body weight: (Table:1)

- Actual Body Weight (ABW) <85% of Ideal Body Weight (IBW) /unintentional weight loss of > 10% in 3-6 months.²

BMI:

- (BMI) < 20 kg/m².

c) Subjective Global Assessment (SGA):

- GI symptoms –anorexia, loss of appetite, nausea, vomiting, diarrhea, evidence of functional impairment, visual assessment of subcutaneous tissue and muscle mass.

d) Reduction in edema free body weight:

- 5% or more in 3 months, 10% or more in 6 months.

e) Simpler assessment tools:

- Anthropometry,⁶ skin fold thickness (to assess the body fat) is carried on the dominant arm that does not have the AV fistula, mid arm circumference to assess the muscle mass, handgrip assessment, diet history to calculate total nutrient intake and deficit. Skin fold thickness is measured in four different sites such as biceps, triceps, subcostal, suprailiac.⁷

Assessment of dietary intake	Diet history, diet recall questionnaires
Anthropometry	Ideal Body weight, Body mass index (BMI), reduction in edema free body weight, skin fold thickness, mid arm muscle circumference.
Biochemical markers	Serum electrolytes, serum proteins (albumin, transthyretin), serum cholesterol, creatinine index, vitamin D levels.
Scoring of nutrition	Subjective global assessment (SGA)
Functional capacitation	Grip strength assessment

Table : 1 Assessment of nutritional status

Frequency of screening process:

- Weekly for inpatients.⁸
- Once in 2-3 months for outpatient with estimated GFR < 20 ml/min, not on Renal Replacement Therapy.
- Monthly after starting Renal Replacement Therapy initially.
- 4-6 monthly for stable maintenance Hemo Dialysis patients.
- 4-6 monthly for stable Peritoneal Dialysis patients.

Macronutrients in CKD :

Calories:(Table:2) A recommended daily intake of 35 kcal / kg / day in patients less than 60 years. A recommended daily intake of 30 kcal / kg / day in patients more than 60 years. Both are formulated for moderate physical activity persons.

Protein: Patients with estimated GFR <25 ml/min and not on dialysis, a total protein of 0.6g/kg/IBW(Ideal Body Weight)/ day is required.⁴ A recommended daily intake of 1.2g / kg / IBW day of protein is required for maintenance Haemodialysis patients. A recommended daily intake of 1.2-1.3g/kg/IBW day of protein for chronic Peritoneal Dialysispatients. At least 50% of the protein prescribed should be of high biological value.⁹, (eg) pulses, poultry, milk, fish, egg with no added salt. This essentially limits production of toxic nitrogenous metabolites which aggravates the uremia and reduces the other metabolic complications like hyperphosphatemia & acidemia.¹⁰

Fat: The total fat intake should be < 30% of the total calorie intake, out of which saturated fat should constitute <7% of total fat. Losing weight if obese and consuming low sugar diet helps in improving hypertriglyceridemia.¹¹

Micronutrients in CKD:

Vitamins: Vitamin-D should be supplemented to maintain a serum level of 30ng/ml (75nmol/lit).^{1,4,5} Patients on HD should be continuously supplemented with water soluble vitamins like B & C.^{9,10} Conversion of vitamin D into 25 hydroxy cholecalciferol occurs in kidney which helps in calcium homeostasis. Erythropoietin may not be adequately synthesized in CKD and parenteral erythropoietin injections are needed.¹² Vitamin C supplements may also help in absorption of iron.¹³ Fortified foods like fruit juices with vitamin C are also available nowadays but the risk of high phosphorous and potassium content in processed foods are to be kept in consideration. Fish oil supplementation helps in reducing the oxidative stress thereby improving the lipid profile in CKD.¹³

Minerals:Sodium: Dietary sodium should be less than 2.4 g/day.¹⁴ Daily salt intake of less than 2 g/day is advised. Fruits such as apple, lemon, pine apple, watermelon and vegetables such as corn, carrot mushroom, cucumber, egg plant have low sodium content.

Potassium: There is no need for potassium restriction unless there is documented hyperkalemia, generally the permissible dietary levels are less than 2.4g/day.

Calcium: Dietary recommendation of calcium is 2 g/day.

Phosphorous: Dietary recommendation of phosphorous is 1000 mg/day to maintain a serum level of 3.5-5.5 mg/dl.

Dietary Fiber: 25-35 g/day of fiber is essential to maintain a balance in fluids and electrolytes.¹⁴ It also prevents constipation thus avoiding accumulation of nitrogenous byproducts. Phosphate binders when given to patients causes constipation. Adequate fiber intake will counteract the effect of Phosphate binders. Foods such as oat bran, corn,barley, are those with high fiber content.¹⁴

DAILY INTAKE	CKD NOT ON DIALYSIS	CKD ON HD	CKD ON PD
1. Energy	35 kcal/kg(< 60 yrs) 30kcal/kg(>60 yrs)	35 kcal/kg(< 60 yrs) 30kcal/kg(>60 yrs)	35 kcal/kg(< 60 yrs) 30kcal/kg(>60 yrs)
2. Protein	0.6 g/kg/IBW	1.2 g/kg/IBW	1.2-1.3g/kg/IBW
3. Sodium	<2 g/day	< 2 g/day	< 2 g/day
4. Potassium	Reduction is necessary only if hyperkalemia is documented	same	same
5. Phosphorous	1000 mg/day	1000 mg/day	1000 mg/day
6. Calcium	2000 mg/day	2000 mg/day	2000 mg/day
7. Dietary fiber	25-30 g/day	30-35 g/day	30-35 g/day

Table : 2 Nutrition Recommendation

Fluid Intake: Posttransplant individuals and patients who are in stage 3-5 Chronic Kidney Disease who are managed conservatively do not need a fluid restriction. Stage 5 CKD patients who are on dialysis a volume of 1000 ml/day plus previous day's urine output is titrated for total fluid intake^{1,9}.

Fallacies in CKD:

Androgens,¹⁵ growth hormone, L-Carnitine, IGF-1¹⁵ supplementations are proved to be invalid in the focus on MNT.

Foods to be cautiously used:

Foods such as red meat, poultry, dairy products, cheese, black beans, red beans, whole grains, dry fruits, preserved and processed foods, chocolates and soda have high phosphorous content and are usually avoided in CKD. When these foods are taken in an urge oral phosphate binders¹⁶ are always to be taken after each meal in such instances.

Sweet potato baked with skin, yogurt, spinach, avocado, pomegranate, tender coconut water, banana, apricot are foods rich in potassium that is to be taken care of. Dietary source of potassium can be reduced by peeling the skin of the vegetable and cutting it into small pieces and washed in large amount of water to leach the excess potassium content in the foods.

Co morbidities in CKD:

Co morbidities like hypertension, cardiovascular complications, Type2 DM, obesity, family h/o kidney disease should be addressed while formulating MNT in CKD & even race and ethnicity have their impact too. In case of diabetes the target HbA1C of 7% is to be achieved.¹⁶

Life style modifications:

Simple physical exercises, aerobics, resistance training, yoga are added benefits in measuring the outcome of MNT.¹⁷

Conclusion:

Medical Nutrition Therapy is a multidisciplinary approach. Food habits are seasonal, complicated and culture based. Familiarity among races, accessibility to certain foods, cost effectiveness play a keyrole in practicing MNT. Knowledge, beliefs, willingness to change their existing food practice and adhering to the newly addressed renal diet and patient's cooperation leads to a successful practice of medical nutritional therapy in CKD.

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