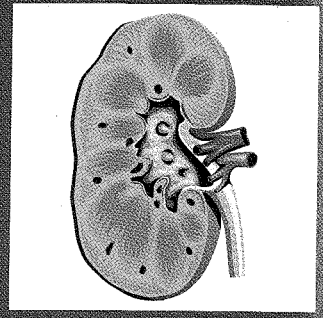
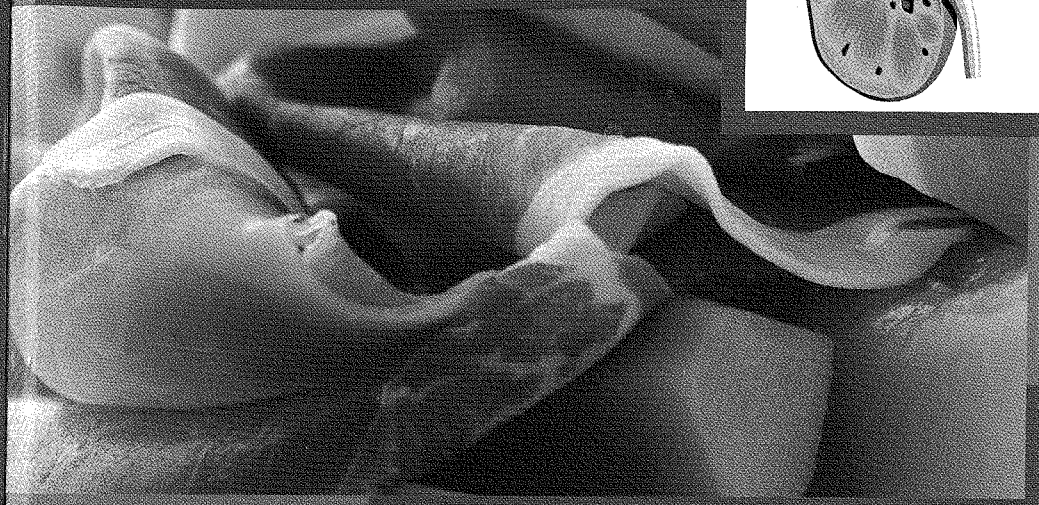
PERSATUAN DIETITIAN MALAYSIA
(MALAYSIAN DIETITIANS' ASSOCIATION)





Medical Nutrition Therapy Guidelines

for Chronic Kidney Disease

MALAYSIAN ASSOCIATION DIETITIANS' 1994

MINISTRY OF HEALTH, MALAYSIA

Medical Nutrition Therapy Guidelines for Chronic Kidney Disease and Dialysis Working Group Committee

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INTRODUCTION

Patients diagnosed with chronic kidney disease (CKD) in Malaysia are an important group of clients for dietitians because the number of patients with chronic kidney disease requiring renal replacement therapy (RRT) increased from 1,985 in 1994 (1st National Renal Registry Report) to 9,995 in 2003 (11th Malaysian Dialysis & Transplant Registry). In tandem with this, the dialysis prevalence rate per million population also increased from 107 in 1995 to 391 in 2003. The prevailing causes of primary kidney disease are diabetes (51 %), unknown causes (30 %), glomerulonephritis (5 %), obstructive nephropathy (3 %), polycystic kidney disease (1 %) and miscellaneous (8 %) (11th Malaysian Dialysis & Transplant Registry).

Protein calorie malnutrition is a common complication of chronic kidney disease (Kopple et al 2000), which if not intervened, progresses when the patient undergoes dialysis. In 2003, 66% of hemodialysis patients and almost 88 % of CAPD patients had serum albumin less than 40 g/dl. Nutritional markers such as low serum albumin, low body mass index (BMI) and low serum cholesterol level have been identified as independent risk factors for death in Malaysian dialysis patients (11th Malaysian Dialysis & Transplant Registry). A survey amongst 116 hemodialysis patients in the Klang valley revealed that 80% of patients had low energy and protein intakes (Karupaiah et al. 2001). Other complications of chronic kidney disease such as cardiovascular disease, anemia and bone disease are also diet-related. Recent studies now suggest that malnutrition is related to inflammation and cardiovascular death amongst kidney failure patients (Stenvinkel et al. 1999).

Appropriate medical nutrition therapy (MNT) provided by a dietitian – for example, dietary modification, counseling and education can help reduce the burden of nutrition-related problems. MNT has an important role in slowing the progression of chronic kidney disease while maintaining optimal nutrition (Levey et al. 1996). In addition, MNT reduces the risk for chronic kidney disease in individuals with diabetes and hypertension (Delahanty 1998). Besides preventing malnutrition, dietitians also addess risk factors for cardiovascular disease such as hypertension, hyperlipidemia, diabetes, smoking and physical inactivity in patients with chronic kidney disease. Nutrition interventions such as restricting dietary phosphorous and encouraging compliance to phosphate binders and vitamin D supplements are important to elevate problems of anemia and bone disease.

The MNT Protocol for kidney disease (non-dialysis and dialysis) is appropriate for adults with chronic kidney disease regardless of the cause. Other protocols for hyperlipidemia, hypertension and diabetes published by Malaysian Dietitians' Association can be used for patients with co-morbidities of hyperlipidemia, hypertension and /or diabetes.

The objectives of this Medical Nutrition Therapy guideline for chronic kidney disease are:

1. To standardize dietary management of patients in Malaysia with chronic kidney disease (non-dialysis & dialysis)
2. To update dietitians in line with internationally developed practice guidelines for renal disease
3. To integrate these guidelines into the scope of practice of Malaysian dietitians

Treatment strategies have been based on levels of evidence using the following Ministry of Health (MOH) system

GRADE A	At least one meta-analysis, systemic review, or randomized controlled trial, or evidence rated as good and directly applicable to the target population
GRADE B	Evidence from well-conducted clinical trials, directly applicable to the target population, and demonstrating overall consistency of results; or evidence extrapolated from meta-analysis, systemic review, or randomized controlled trial
GRADE C	Evidence from expert committee reports, or opinions and/or clinical experiences or best practices of respected authorities; indicates absence of directly applicable clinical studies of good quality.

Ref : Ministry of Health (2003)

These nutrition guidelines are meant to serve as a general framework for managing patients with kidney disease. The independent skill and judgement of the dietitian and/or health care provider must always dictate treatment decisions as patients' individual circumstances may vary. Co-morbid complications, socioeconomic conditions, cultural practices and patients' preferences are to be considered in the decision-making process.

STAGES OF CHRONIC KIDNEY DISEASE & RISK FACTORS

Patients with kidney disease are currently classified as chronic renal failure, end-stage renal failure or patients undergoing dialysis. In the year 2000, K/DOQI defined and classified chronic kidney disease (CKD) as shown below in Table 1. The decline in renal function is usually progressive and CKD is defined as GFR less than 60 ml/min/1.73m^2 for more than 3 months.

Table 1 Stages of chronic kidney disease and medical action plan

Stage	Description	GFR* (ml/min/1.73m^2)	Medical action plan
1	Kidney damage with normal or high GFR	90	Diagnosis and treatment, treatment of co-morbid conditions, slowing progression, CVD risk reduction
2	Kidney with mild, reduced GFR	60-89	Estimating progression
3	Moderate reduced GFR	30-59	Evaluating and treating complications
4	Severe reduced GFR	15-29	Preparation for kidney replacement therapy
5	Kidney failure	< 15 (or dialysis)	Replacement therapy

Source : K/DOQI (2003)

Modifiable risk factors for progression of CKD include:

- Control of blood pressure (Jafar et al. 2003)
- Control of proteinuria or albuminuria (JNC-7, 2003)
- Control of HBA1c (DCCT, 1993)
- Cessation of smoking, reduction in dyslipidemia and increase in physical activity promote organ blood flow and potentially reduce CKD damage (Beto & Bansal 2004).

OBJECTIVES OF NUTRITION MANAGEMENT

A. Early chronic kidney disease (Stage 1 & 2)

Early chronic kidney disease usually manifests in conditions such as diabetic nephropathy, uncontrolled hypertension and other kidney diseases. During this stage, the dietary management should focus on:

1. Treatment of co-morbid conditions such as diabetes, hypertension, and other chronic diseases to slow the progression of renal failure
2. Reduce the risk for cardiovascular diseases such as hyperlipidaemia.
3. Providing regular nutritional counselling based on an individualized plan of care in order to promote good quality of life.

B. Pre- Dialysis (Stage 3 & 4)

This stage refers to patients who are diagnosed with chronic renal failure (CRF). Control of blood pressure (Levey et al 1996) and intensive blood glucose control in patients with diabetes (DCCT 1993, UKPDS 1998) are the strategies to delay the progression of kidney failure. A low protein diet has been shown to retard the progression of kidney failure (Levey et al. 1996). However, a high prevalence of protein-energy malnutrition is associated in non-dialyzed patients with advanced chronic kidney failure (Kopple 1999). Therefore, ensuring good nutritional status at the initial stage of kidney failure can reduce the consequences of malnutrition and the rate of mortality and morbidity (K/DOQI, 2000). Maintaining physical activity is advantageous to improve lean body mass and quality of life (Castaneda et al. 1998) although exercise has not been proven to retard progression of kidney failure (Eidemak et al. 1997).

The objectives of management at this stage are

1. To delay the progression of kidney failure
2. Maintain good nutritional status in preventing malnutrition by
   - giving adequate protein and energy
   - ensuring sufficient nutrients such as calcium, iron, and other vitamins and minerals.
3. Minimize electrolyte and mineral disturbances such as phosphate, potassium, calcium, sodium and fluids to manage co-morbidities (anemia, bone disease, hypertension)
4. Encourage physical activity according to patient's condition and ability.
5. Providing regular nutritional counselling based on an individualized plan of care in order to promote good quality of life

C. Haemodialysis(HD) and continous ambulatory peritoneal dialysis (CAPD) (Stage 5)

Maintenance haemodialysis patients are at risk of malnutrition (Laville & Fouque 2000, Wolfson 1999). The dialysis procedure itself may accentuate malnutrition by removing nutrients and by stimulating protein catabolism (Laville & Fouque 2000). Approximately 10-12g of amino acid losses occur during HD per session (Bergstrom 1993). Several prospective studies conclude that adequate dietary protein and energy intake are necessary to ensure neutral or positive nitrogen balance in haemodialysis patients (K/DOQI 2000, Slomowitz et al 1989).

CAPD patients are more prone to malnutrition than HD patients. Protein losses into peritoneal dialysate are higher than losses into haemodialysate (K/DOQI, 2000) i.e. 3-15 g per day and considerably higher during episodes of peritonitis (Piraino 1996). Therefore, it is important to maintain an adequate intake of protein (Jacob et al 1995) and energy to maintain nitrogen balance (Piraino 1996, Bergstrom et al. 1993) in order to achieve good nutritional status. However, glucose calories from the dialysate should be calculated when determining the recommended total energy intake for these patients (Piraino 1996, Wolfson 1999).

The objectives of management in dialysis population are:

a. Maintain or improve nutritional status in order to prevent malnutrition by
   - giving adequate protein and energy
   - ensuring sufficient nutrients such as calcium, iron and other vitamins and minerals.
b. Minimize electrolyte and mineral disturbances such as phosphate, potassium, calcium, sodium and fluids
c. Control fluid intake.

d. Prevent and manage co-morbidities such as cardiovascular disease, anemia, bone disease and diabetes
e. Encourage physical activity according to patient's condition and ability
f. Provide regular nutritional counselling based on an individualized plan of care in order to promote good quality of life.

NUTRITION ASSESSMENT AND MONITORING

GFR of less than 60 ml/min is associated with decreases in laboratory parameters of serum albumin, hemoglobin, serum bicarbonate, decreases in body weight and dietary intake of protein and energy (Kopple et al. 1989; Ikizler et al. 1995). Therefore, all CKD patients should undergo nutrition assessment to evaluate protein calorie malnutrition followed with appropriate intervention.

Nutrition assessment of the CKD patient includes routine methods to detect, diagnose, characterize, classify and predict malnutrition. An optimal protocol to identify malnutrition in kidney patients has not yet been developed. It is suggested that dietitians use a combination of methods. The frequency of assessment and monitoring should be increased if there is frank malnutrition and other co-morbidities. Tracking progress of the patient is considered a more reliable benchmark than comparing to group standards.

Factors that can lead to malnutrition include (Mitch & Klahr 2002)

1. Increased needs and additional losses
2. Abnormal metabolism, absorption, or utilization of nutrients
3. Inadequate dialysis treatment
4. Anorexia, inappropriate or poor intake
5. Excessive dietary restriction
6. Psychosocial problems
7. Superimposed illness such as infections
8. Catabolism of dialysis (including bio incompatible membranes)
9. Endocrine disorders
10. Acidosis

It has been shown that dialysis patients with BMI above 25 had a 28 % less risk of death compared to patients with BMI less than 18.5 (11th Malaysian Dialysis & Transplant Registry). A higher body mass index (BMI) of 25-28 is correlated to higher survival rates compared to lower BMI for CKD patients (K/DOQI 2003). However, body composition is also important. For example, the BMI of peritoneal dialysis patients are higher than hemodialysis patients but CAPD patients are more prone to protein malnutrition (K/DOQI 2003).

ANTHROPOMETRIC ASSESSMENT

Assesment factors	Stages of CKD	Frequency of assessment/ monitoring					Expected outcome	Ideal/goal value
		Base line	1-3 mths	3-6 mths	12 mths	As needed		
Weight/BMI	**Early CKD** *(Stage 1&2)*	X		X			Maintain normal weight	BMI 20-25
Height		X			X		Maintain usual height	
Body composition using bioimpedance (BIA)						X	Maintain normal body fat & lean body mass	
Weight/BMI	**Pre-dialysis** *(Stage 3&4)*	X	X				Maintain normal weight	BMI 20-25
Height		X			X		Maintain usual height	Note height changes yearly due to bone loss
Body composition using bioimpedance (BIA)						X	Maintain normal body fat & lean body mass	
Subjective Global Assessment (SGA)		X		X			Progres-sion to a better SGA score level	Level A score
Tricep skinfold or mid-arm circumference (MAC)		X		X			Maintain normal value	> 50th percentile
Weight/BMI (post-dialysis (HD) /post-drainage (CAPD) weight)	**Dialysis (HD & CAPD)** *(Stage 5)*	X		X			Maintain BMI Acceptable interdialytic weight gain for HD	BMI not less than 24. However, if BMI > 30 weight loss may be beneficial Interdialytic weight gain : 2-3 kg or less than 3-5 % dry weight

ANTHROPOMETRIC ASSESSMENT (con't)

Assesment factors	Stages of CKD	Frequency of assessment/ monitoring					Expected outcome	Ideal/goal value
		Base line	1-3 mths	3-6 mths	12 mths	As needed		
Height	**Dialysis (HD & CAPD)** *(Stage 5)*	X			X		Maintain usual height	Note height changes yearly due to bone loss
Body composition using bioimpedance (BIA)						X	Maintain normal body fat & lean body mass	
Subjective Global Assessment (SGA)		X		X			Progression to a better SGA score level	Level A score
Tricep skinfold or mid-arm circumference (MAC)		X		X			Maintain fat & muscle store	> 50th percentile

BIOCHEMICAL ASSESSMENT

Assesment factors	Stages of CKD	Frequency of assessment					Expected outcome	Ideal/goal value
		Base line	1-3 mths	3-6 mths	12 mths	As needed		
Serum albumin	**Early CKD & Pre-dialysis** *(Stage 1-4)*	X	X				Maintain normal range	> 35-40 mg /dl (bromocre sol green assay)
Serum potassium		X	X				Maintain at normal range	3.5-5.5 mmol/l
Serum calcium (corrected)		X	X				Maintain at normal range	2.0-2.6 mmol/l
Serum phosphate		X	X				Maintain at normal range	0.8-1.6 mmol/l Ca X P < 4.2mmol²/l²
Serum creatinine / urea		X	X				Stabilize excretion	Stabilizes
Microalbumin		X			X		Stabilize excretion	< 3 mg/dl

BIOCHEMICAL ASSESSMENT (con't)

Assesment factors	Stages of CKD	Frequency of assessment					Expected outcome	Ideal/goal value
		Base line	1-3 mths	3-6 mths	12 mths	As needed		
Serum lipids	**Early CKD & Pre-dialysis** *(Stage 1-4)*	X		X			Maintain at normal range	Chol < 5.2 mmol/l LDL < 3.8 HDL > 1.2 TG < 1.6
FBS/ HbA1c (if diabetic)		X		X			Maintain at acceptable range	FBS< 6 mmol/l HbA_{1c} < 6.5%
Hemoglobin		X	X				Adequate iron status for erythr opoiesis	Hb > 11 g/l
Blood pressure		X	X				Achieve blood pressure goal	BP < 130/ 80
Serum albumin	**Dialysis (HD & CAPD)** *(Stage 5)*	X		X			Maintain normal range	> 35-40 mg /dl
Serum potassium		X		X			Maintain at normal range	3.5-5.5 mmol/l
Serum calcium (corrected)		X		X			Maintain at normal range	2.0-2.6 mmol/l
Serum phosphate		X		X			Maintain at normal range	0.8-1.6 mmol/l
Serum lipids		X			X		Maintain at normal range	Chol < 5.2 mmol/l LDL < 3.8 HDL > 1.2 TG < 1.6
FBS / HbA1c (if diabetic)		X		X			Maintain at acceptable range	FBS< 6 mmol/l HbA1c < 6.5%
Hemoglobin		X		X			Adequate iron status for erythro poiesis when rHuEPO is administered	Hb > 11 g/l

BIOCHEMICAL ASSESSMENT (con't)

Assesment factors	Stages of CKD	Frequency of assessment					Expected outcome	Ideal/goal value
		Base line	1-3 mths	3-6 mths	12 mths	As needed		
Kt/V	**Dialysis (HD & CAPD)** *(Stage 5)*	X		X			Dialysis adequacy should be achieved	Kt/V > 1.3 for HD Kt/V > 1.8 for CAPD
Blood pressure		X	X				Achieve blood pressure goal	BP < 130/80

DIETARY ASSESSMENT AND LIFESTYLE CHANGES

Assesment factors	Stages of CKD	Frequency of assessment					Expected outcome	Ideal/goal value
		Base line	1-3 mths	3-6 mths	12 mths	As needed		
Nutrient intake & meal plan 24hr recall or food record, specific food checklists e.g protein, potassium, phosphate, sodium.	**Early CKD Pre-dialysis Dialysis** *(Stage 1-5)*	X		X			Adequate intake of energy & protein Choose 50% high biological value (HBV) protein Limit total fat, sat fat & cholesterol Regular mealtimes & spacing of meals if diabetic Consume potassium & phosphate, sodium to keep blood values normal Consume calcium supplements if prescribed	As per nutrient prescription

DIETARY ASSESSMENT AND LIFESTYLE CHANGES (con't)

Assesment factors	Stages of CKD	Frequency of assessment					Expected outcome	Ideal/goal value
		Base line	1-3 mths	3-6 mths	12 mths	As needed		
Food/ supplement intake - checklist on vitamin & mineral supplements - check list for herbal/ traditional products	**Early CKD Pre-dialysis Dialysis** ***(Stage 1-5)***	X		X			Maintains adequate nutrient intake Ensure foods/ supplement taken do not interact with drugs/ lab values	Consumes more than 80% phosphate binders with meals/ snacks as prescribed Consumes vitamins & minerals as prescribed by physician
Eating out		X		X			Select appropriate foods	
Smoking/ use of alcohol		X		X			Limit or stop smoking & alcohol	
Recipe modification & food preparation						X	Use methods to reduce sodium, potassium or phosphate.	
Food label reading						X		
Physical activity		X		X			Participate in physical activity as appropriate	Maintains muscle mass & strength
Functional status Activity of Daily Living		X		X			Improve or maintains functional status	Optimum functional status
DETERMINE Nutrition Awareness Checklist		X				X	Recommend to use for elderly patients to assess malnutrition risk factors	

Ref : K/DOQI (2000 & 2003) ; Wiggins (2002)

NUTRITION PRESCRIPTION

Note : For calculations using body weight (BW) please refer to Appendix 1

Nutrient	Stage of CKD	Recommendation	Rationale
CALORIES	**Early CKD including Diabetic Nephropathy** ***(Stage 1 & 2)*** **Predialysis** ***(Stage 3 & 4)***	35 kcal/kg body weight if < 60 years of age 30-35 kcal/kg if > 60 years of age	• Maintaining normal body weight is essential. • However, weight loss is recommended in obese individuals to control hypertension, diabetes, hyperlipidemia and other co-morbidities. • The energy requirement in CKD patients are similar to the general population (Schneeweiss et al 1990) • Adequate energy intake is important to maintain neutral nitrogen balance, to promote higher serum albumin concentrations and more normal anthropometric parameters and to improve protein utilization (Kopple et al 1986).
	Haemodialysis	35 kcal/kg body weight if < 60 years of age 30-35 kcal/kg if > 60 years of age	• Energy expenditure of patients undergoing maintenance haemodialysis is similar to that normal, healthy individuals (K/DOQI 2000). • Studies indicate that the mean energy intake of about 35kcal/kg/d induces neutral nitrogen balance and is adequate to maintain serum albumin and anthropometric indices (Slomowitz et al 1989). • Acutely ill maintenance dialysis patients are generally inactive physically and their energy needs will be diminished by the extent to which their physical activity has been decreased. Thus energy intakes of 30 – 35 kcal/kg BW are recommended (K/DOQI 2000)
	CAPD and peritonitis	35 kcal/kg body weight if < 60 years of age 30-35 kcal/kg if > 60 years of age (includes calories from dialysate due to glucose absorption)	• The recommended total daily energy intake, including both diet and energy intake derived from the glucose absorbed from peritoneal dialysate should be 35kcal/kg/d (K/DOQI 2000) • Approximately 60-70 % of dialysis fluid glucose may be absorbed during a six hour dwell (Bannister DK et al 1987) • Small frequent meals are recommended due to early satiety in patients • **Caution** : Monitor weight gain in CAPD patients
PROTEIN	**Early CKD including Diabetic Nephropathy** ***(Stage 1 & 2)***	0.8 g/kg BW	• The requirement for protein is unchanged in well control diabetics, but in hyperglycemic individuals, protein synthesis is decreased and protein breakdown increased, leading to a negative nitrogen balance. This suggests that during periods of hyperglycemia or weight loss, somewhat higher protein intakes are required to achieve nitrogen balance, but whether this alone will correct the abnormality is unknown (Dikow et al 2002).

NUTRITION PRESCRIPTION

Note : For calculations using body weight (BW) please refer to Appendix 1

Nutrient	Stage of CKD	Recommendation	Rationale
PROTEIN			• Studies demonstrate positive benefit of limiting protein intake to 0.8 g/kg body weight in early diabetic nephropathy (Pedrini et al 1996, Fouque et al 1992, Kasiske et al 1998).
	Predialysis ***(Stage 3 & 4)***	0.6 g/kg BW if severe malnourish, use 0.75 g/kg BW at least 50 % HBV protein	• Low protein will maintain nutritional status (Kopple et al 1973, Walser 1993, Tom et al 1995, Fleischmann et al 1998, Kopple et al 1997) particularly if they receive higher energy intake (ie, 35kcal/kg/d) (Kopple et al 1986). • Low protein diet reduces the generation of nitrogenous waste and inorganic ions which causes many of the clinical and metabolic disturbances characteristic of uremic individuals (K/DOQI 2000). • Low protein diet retards the progression of renal failure (Levey et al 1999, Levey & Green et al 1999) or delays in the onset of renal replacement therapy (Pedrini et al 1996, Fouque et al 1992, Kasiske et al 1998). • For patients who are malnourished, protein intake of 0.75 g/kg is recommended (K/DOQI 2000). • HBV has an amino acid composition that is similar to human protein, is likely to be animal protein and tends to be utilized more efficiently by human to conserve body proteins individuals (K/DOQI 2000). • **Caution:** if patient is planning to undergo dialysis, a higher protein intake may be warranted and ensure energy intake is adequate.
	Haemodialysis	1.2 g/kg BW 1.3 g/kg BW if severe malnourish 1.3 g/kgBW if acute illness (if increase intensity in dialysis) at least 50% HBV protein	• Studies show that protein intake less than 1.2g/kg/d are associated with lower serum albumin levels and higher morbidity. in HD patients (Acchiardo et al 1990) • Protein intakes greater than 1.2 or 1.3 g/kg/d may also benefit the catabolic, acutely ill haemodialysis patients
	CAPD	1.2-1.3 g/kg BW if acute illness, 1.3 g/kg BW at least 50 % HBV protein	• Hypoalbuminemia is more likely to occur when the protein intake is less than 1.3 g/kg/d and significantly associated with an increased incidence of peritonitis and more prolonged hospital stay (Shilling et al 1985).

NUTRITION PRESCRIPTION

Note : For calculations using body weight (BW) please refer to Appendix 1

Nutrient	Stage of CKD	Recommendation	Rationale
CARBO-HYDRATE	**Early CKD including Diabetic Nephropathy** ***(Stage 1 & 2)***	50-60 % of energy intake	• Carbohydrates should be utilized to make up the balance of the required daily energy intake • Complex CHO is recommended & dietary fiber for good glycemic control in diabetic patients (Beto 1995).
	Predialysis ***(Stage 3 & 4)*** **Haemodialysis CAPD** ***(Stage 5)***	50-60 % of energy intake For diabetic patients, follow diabetic diet guidelines.	• Incorporating low protein carbohydrate food sources(see Appendix 10) and simple sugars can assist in meeting energy requirements of patients on low protein diet For diabetics, • Simple sugars need to be minimized Complex CHO & dietary fiber are recommended to minimize elevation of serum triglycerides. Caution: monitor serum potassium & phosphate levels if whole grain products are used.
FATS	**Early CKD including Diabetic Nephropathy** ***(Stage 1 & 2)*** **Predialysis** ***(Stage 3&4)*** **Haemodialysis CAPD** ***(Stage 5)***	• Total fat : 25-35 % total calories • Emphasize reduced saturated fat: less than 7 % total calories • Polyunsaturated fats (PUFA) up to 10 % of total calories • Monounsaturated fats (MUFA) up to 20 % of total calories • Cholesterol: < 200 mg/day • Fiber : 20-30 g per day (monitor blood potassium & phosphate level) • Encourage daily regular physical activity whenever possible • If dietary intervention is inadequate, drug therapy should be started after 3 months (K/DOQI 2003)	• Patients are considered at highest risk for cardiovascular disease (K/DOQI 2003) • In non-diabetic predialysis patients, hypertryglyceridaemia can be reduced by both increasing the dietary polyunsaturated: saturated fat ratio and reducing the carbohydrate content of the diet. • Patients with other coronary risk factors (smoking, hypertension, obesity, and lack of exercise) should be encourage to modify their behavior, in conjunction with the modified lipid diet. • Management of lipid abnormalities by dietary carbohydrate and fat restriction alone has been reported to be effective in dialysis patients. However, additional dietary restriction is difficult to achieve in the already fluid and protein restricted patient, and the limited benefit of diet is counterbalanced by the risk of malnutrition in these patients. • Promotion of exercise may benefit patients.

NUTRITION PRESCRIPTION

Note : For calculations using body weight (BW) please refer to Appendix 1

Nutrient	Stage of CKD	Recommendation	Rationale
SODIUM	**Early CKD** ***(Stage 1 & 2)***	Low sodium intake *(less than 2.4 g/day (K/DOQI 2003)*	• Evidence shows that strict control of blood pressure can delay renal progression and control CVD • Other lifestyle modifications recommended: weight control, reduce intake of saturated fat & cholesterol, glycemic control, limit alcohol, exercise and stop smoking. (K/DOQI 2003)
	Pre dialysis ***(Stage 3 & 4)***	Low sodium intake *(less than 2.4 g/day (K/DOQI 2003)* * Gradual reduction is recommended to maximize tolerance and acceptance	• Sodium excretion is inadequate in advanced renal failure. • High sodium intake will cause increase in extra cellular volume and sodium imbalance. • High sodium intake limits the efficacy of anti – hypertensive medication (Mailloux et el 1998).
	Haemodialysis	2 – 3 g sodium per day *(ADA 2002)*	• High sodium intake also increases thirst in patients and complicates fluid control. • Sodium should be individualized based on blood pressure and weight. (ADA 2002) • Generally, no added salt diet is recommended
	CAPD	2 – 4 g sodium per day *(ADA 2002)*	
FLUIDS	**Early CKD** ***(Stage 1 & 2)*** **Pre dialysis** ***(Stage 3 & 4)***	Generally no restriction. Keep fluid balance to maintain hydration status *(ADA 2002)*	• The damaged kidney's capacity to handle water is limited. Total fluid intake must be monitored to avoid fluid overload or dehydration. • Fluid retention may be a problem in some patients will require individualized advice on fluid intake if medically indicated. • Fluid recommendation must take into consideration environmental temperature and activity level of the patient • Signs of fluid overload and dehydration should be noted (refer Appendix 11).
	Haemodialysis	750 to 1000 ml/day	• Fluid balance is affected by : **a.** Control of dietary fluid intake **b.** Fluid removal on dialysis c. Sodium intake • High interdialytic weight gain among patients on haemodialysis results in increased mortality risk (Kimmel et al) • Maintain fluid gain between haemodialysis (interdialytic weight gain) to less than 3 % - 5 % dry weight (ADA 2002) or 2 to 3kg
	CAPD	Up to 1500 ml/day	• Fluid balance is affected by a. Control of dietary fluid intake b. Ultrafiltration capacity of peritoneal membrane c. Sodium intake • Ultrafiltration normally can remove 2.0-2.5 kg fluids per day.

NUTRITION PRESCRIPTION

Note : For calculations using body weight (BW) please refer to Appendix 1

Nutrient	Stage of CKD	Recommendation	Rationale
FLUIDS	**CAPD**		• Increasing ultrafiltration through the use of hypertonic exchanges can treat fluid overload. However, over-reliance on hypertonic (high glucose) solutions to control symptoms of fluid overload results in d. High risk of obesity e. Hypertriglyceridemia f. Damage to peritoneal membrane (EDTNA/ERCA 2002)
POTASSIUM	**Early CKD** ***(Stage 1 & 2)*** **Pre dialysis** ***(Stage 3 & 4)*** **Haemodialysis** **CAPD**	No restriction unless blood potassium level is elevated No restriction unless blood potassium level is elevated 2 to 3 g adjust to serum levels *(8-17 mg/kg body weight)* 3 to 4 g adjust to serum levels *(8-17 mg/kg body weight)*	• Patient's potassium levels may be depressed or elevated. • Hyperkalemia can cause cardiac arrhythmias or cardiac arrest • Consider non – dietary causes of hyperkalemia (Bansal 1992) a. Loss of residual renal function b. Acidosis c. Catabolism d. Inadequate dialysis e. Dialysate K concentration too high g. Drug induced: 1. ACE inhibitors (Enalapril, Captopril, Perindopril, Delapril, Quinapril, Lisinopril, Ramipril, Fosinopril) 2. NSAIDS 3. K sparring diuretics (e.g Slow K / mist KCL) • Caution on use of potassium salt substitutes in sodium restricted diets (e.g. Pan Salt) • In CAPD, patients may be hypokalemic due to continuous removal of potassium in dialysate and given potassium supplements.
PHOSPHATE	**Early CKD** ***(Stage 1 & 2)*** **Pre-dialysis** ***(Stage 3 & 4)*** **Haemodialysis** **CAPD**	No restriction unless indicated by lab values 800-1000 mg/day *(adjust for dietary protein needs)*	• Hyperphosphatemia and the associated conditions begin to appear as GFR declines < 60 ml/min. • Hyperphosphatemia, elevated parathyroid hormone (PTH), secondary hyperparathyroidism with depressed serum calcium and vitamin D deficiency are metabolic disturbances. • They require early detection and treatment to prevent bone disease of chronic hyperparathryoidism, and to minimize the increased risk for cardiovascular disease (Slatopolsky E, Block et al 1998)(Ammann K et al, 1999 , Block GA et al, 2000) • In predialysis patients, prescription of low protein intake has been shown to be effective to prevent or correct hyperphosphatemia. (MDRD, 1994) • A limited removal of phosphate occurs with dialysis.

Note : For calculations using body weight (BW) please refer to Appendix 1

Nutrient	Stage of CKD	Recommendation	Rationale
PHOSPHATE			• The appropriate dose of phosphate binder should be ideally based on phosphorus content of meals and snacks. It should be taken with meals. The type of phosphate binder usually used are calcium carbonate and calcium acetate.
CALCIUM	**Early CKD** ***(Stage 1 & 2)***	Intake should meet recommended daily intake requirements	
	Pre-dialysis ***(Stage 3 & 4)*** **Haemodialysis** **CAPD** ***(Stage 5)***	The total elemental calcium provided by calcium-based phosphate binder should not exceed 1500 mg/day. Calcium from diet plus phosphate binder should not exceed 2000 mg/day. *(K/DOQI 2003).*	• Serum calcium level is influenced by dietary intake and calcium - based phosphate binders e.g. calcium carbonate. • Excessive use of calcium containing phosphate binders can lead to hypercalcemia and metastatic calcification of soft tissues. • Non-calcium based phosphate binders are currently not available in Malaysia such as lanthanum salts but may be available in the near future. • Aluminium-based phosphate binders are also used in some patients as a short-term therapy. • When determining the calcium needs of a patient, consider: a. the calcium concentration in dialysate b. amount of calcium in phosphate binder c. dietary and supplemental intake • Foods rich in calcium is also high in phosphate and protein content especially dairy products and soybean products, therefore these foods should be recommended under caution.
Iron	**Early CKD** ***(Stage 1 & 2)*** **Pre-dialysis** ***(Stage 3 & 4)*** **Haemodialysis** **CAPD** ***(Stage 5)***	Intake should meet recommended daily intake requirements Achieve with supplementation of 200 mg elemental iron *(K/DOQI 2003)*	• Iron supplementation is necessary for effective erythropoiesis for red blood cell production. • Vitamins such as folate and vitamin B12 are needed for adequate response to erythropoiesis *(Sander et al, 1994)* • In haemodialysis, there is increased blood loss through dialysers, frequent venupuncture through dialysers, frequent venupuncture and poor iron absorption in gastrointestinal tract. There is a need for supplementation to prevent iron deficiency and maintain adequate iron stores *(Drueke, 2001)* • Iron tablets should be taken 1-2 hours after meals to enhance absorption. Iron should not be taken with phosphate binders. • Iron tablets may also cause constipation in patients and laxatives may be prescribed.

Note : For calculations using body weight (BW) please refer to Appendix 1

Nutrient	Stage of CKD	Recommendation	Rationale
WATER SOLUBLE VITAMINS			• Anorexia, co-morbid conditions or therapeutic dietary restriction results in unpalatable diet, poor food intake and inadequate vitamins and minerals • Patients with kidney disease will have low water soluble vitamins level due to losses from the body especially for patients on HD and CAPD • Patients will need to be supplemented with most water-soluble vitamins during pre-dialysis and dialysis stage. It is usually given as a B-complex tablet.
Thiamine	**Pre-dialysis** ***(Stage 3 & 4)*** **Haemodialysis** **CAPD** ***(Stage 5)***	Supplement to meet recommended daily intake requirements	• Thiamine deficiency is associated with potassium restricted and protein restricted diets. • There is also increased loss in dialysis.
Riboflavin		Supplement to meet recommended daily intake requirements	• Riboflavin is found mostly in meat, thus low levels may be found in patients on a protein – restricted diet
Pyridoxine		Supplement to meet recommended daily intake requirements	• Meat is a source rich in pyridoxine. Low levels may be found in patients on erythropoetin and protein restricted diet.
Folate Vitamin B12		Supplement to meet recommended daily intake requirements	• Low folate level may increase homocysteine levels and increase risk of cardiovascular disease in pre-dialysis and dialysis patients • Low potassium diet and patients on erythropoietin need supplementation • Regular supplementation of folate and B12 up to 1 mg are safe and recommended to prevent deficiencies. (ADA, 2002)
Vitamin C		Supplement up to 60-100 mg/day	• Vitamin C supplementation helps in oral iron absorption • In dialysis, there is increased losses and reduced absorption • However, high Vitamin C intake results in hyperoxalosis and increased of vascular disease. Excessive supplementation of Vitamin C is discouraged
FAT SOLUBLE VITAMINS Vitamin A	**Pre-dialysis** ***(Stage 3 & 4)*** **Haemodialysis** **CAPD** ***(Stage 5)***	Intake should meet recommended daily requirements	• Serum vitamin A is high in pre-dialysis and dialysis patients. • Oral supplements are not recommended for Vitamin A • Caution against use of fish/ cod liver oil and other vitamin A-rich supplements.
Vitamin E		Intake should meet recommended daily requirements	• Oral supplements are not recommended for Vitamin E

NUTRITION PRESCRIPTION

Note : For calculations using body weight (BW) please refer to Appendix 1

Nutrient	Stage of CKD	Recommendation	Rationale
Vitamin D	**Pre-dialysis** ***(Stage 3 & 4)*** **Haemodialysis** **CAPD** ***(Stage 5)***		
		May be given active vitamin D therapy by physician	• CKD is characterized by diminished synthesis and resistance to active Vitamin D metabolite (calcitriol) (ADA 2002). • Treatment with calcitriol may help raise serum calcium (improves bone turnover) and suppress secondary hyperparathyroidism. (Delmez et al, 1990, ADA 2002). However, treatment with vitamin D may need to be stopped to prevent adynamic bone disease • Serum calcium, phosphate and PTH level needs to be monitored with Vitamin D supplementation (Martin et al, 2001)

NUTRITION IMPLEMENTATION

Early CKD : to follow as MNT Guidelines for Diabetes, Hypertension and Hyperlipidemia (MDA 2005) with strict emphasis towards optimum control of blood sugar and blood pressure.

Pre-dialysis (stage 3 & 4)

First visit – in patient : within 3 days, out patient within 1 month of referral (45 to 60 minutes for outpatients, inpatient 30 minutes minimum according to priority)

1. Assess anthropometry, laboratory values, dietary intake, physical activity, lifestyle habits and functional status as per recommendation.
   a. Evaluate height, weight, weight changes, BMI and body composition
   b. Evaluate stages of kidney failure based on GFR (if available)
   c. Evaluate laboratory data: renal function & serum albumin
   d. Evaluate other clinical data & co-morbidities: blood sugar, blood pressure, hemoglobin and edema
   e. Note medications prescribed to patient
   f. Evaluate current intake of calories, protein, type of fat, sodium and intake of calcium, potassium and phosphorous (if necessary depending on biochemistry profile).
   g. Evaluate patient's appetite, GI symptoms, altered taste and other food behavior
   h. Evaluate meal pattern, intake of health supplements and traditional medicine
   i. Evaluate current physical activity pattern and functional status
   j. Evaluate smoking and alcohol intake
   k. Evaluate socioeconomic background and psychosocial issues
   l. Evaluate patient's knowledge of kidney disease
   m. Evaluate motivational level of patient and willingness to comply
2. Prescribe individualized energy and nutrients
   a. calories to maintain reasonable body weight.
   b. protein restrictions based on GFR, urinary protein losses. Ensure 50% HBV protein minimum.
   c. type of fat (if hyperlipidemic)
   d. % CHO and sodium restriction (if diabetic and/or hypertensive)
   e. other nutrients : potassium, phosphate, calcium, vitamin/mineral (as appropriate)
   f. fluids (as appropriate)

3. Patient education
   a. Provide rationale for role of diet in slowing progression of renal disease
   b. Provide rationale on good control of diabetes and hypertension (if appropriate)
   c. Discuss laboratory values and significance of results
   d. Discuss basic nutrition guidelines for ESRD: protein restrictions, adequate energy intake and prevention of malnutrition.
   e. Provide meal plan and suggestions on appropriate foods to meet energy needs
   f. Provide protein portion sizes as per recommendation
   g. Provide examples of foods for other relevant nutrients (fats, CHO, sodium, phosphate, etc. if appropriate)
   h. Discuss use and timing of phosphate binders (if relevant)
   i. Discuss meal timings and snacks (if diabetic)
   j. Discuss physical activity recommendations, if appropriate
   k. Discuss change of unhealthy habits such as smoking and alcohol intake (if relevant)
   l. Provide relevant diet sheets and food lists, if needed and available
4. Documentation and follow-up plan
   a. Provide documentation to physician and other health care team members according to individual's hospital policy
   b. Provide timeline for follow-up with patient

Follow-up visits – 3-6 monthly intervals (30 to 45 minutes)

1. Review clinical data
   a. Changes in medical and rate of decline in kidney status
   b. Changes in therapy/medications
   c. Changes in biochemical profile
   d. Changes in weight, muscle, fat stores and edema
   e. Physical signs of malnutrition / nutrient deficiencies
   f. Blood sugar and blood pressure control (if appropriate)
2. Review dietary intake
   a. Assess appropriateness of calories, protein and other relevant nutrients
   b. Assess changes in patient's appetite, GI symptoms and food habits
   c. Assess meal plan, food choices and portions
3. Review understanding of previous dietary advice, medications and laboratory values
4. Review energy intake and suggest low protein sources to meet energy needs.
5. Review understanding of protein portion sizes
6. Review intake of phosphate binders (if appropriate)
7. Review meal timings and snacks (if diabetic)
8. Review lifestyle habits – smoking and alcohol intake (if relevant)
9. Review changes in functional ability and activity level
10. Review and reinforce basic dietary guidelines and activity patterns
11. Discuss eating out food choices, appropriate recipe and food preparation modifications , food labels
12. Determine willingness and ability to make further changes
13. Documentation

HEMODIALYSIS/ CAPD

First visit – within 1 month of referral (45 to 60 minutes)

1. Assess anthropometry, laboratory values, dietary intake, physical activity, lifestyle habits and functional status as per recommendation.
   a. Evaluate height, weight, weight changes, BMI and body composition
   b. Evaluate dry weight prescribed by physician, interdialytic weight changes for HD and pre and post drainage weight for CAPD

c. Evaluate prescription for dialysis: frequency and type of dialysate (HD), concentration of dialysate and number of exchanges (CAPD)
d. Evaluate laboratory data: renal function and serum albumin
e. Evaluate other clinical data and co-morbidities: blood sugar, blood pressure, hemoglobin, edema
f. Note medications prescribed to patient
g. Evaluate current intake of calories, protein, type of fat, sodium and intake of calcium, potassium, phosphorous and fluid (depending on biochemistry profile and weight changes).
h. Evaluate patient's appetite, GI symptoms, altered taste and other food behavior
i. Evaluate meal pattern, intake of health supplements, traditional medicine
j. Evaluate current physical activity pattern and functional status
k. Evaluate smoking and alcohol intake
l. Evaluate socioeconomic background and psychosocial issues
m. Evaluate patient's knowledge of dialysis procedure and preconception from ESRD
n. Evaluate patient's motivational level for compliance

2. Prescribe individualized energy and nutrients
   a. calories to maintain reasonable body weight.
   b. protein intake as per mode of dialysis. Ensure 50% HBV protein minimum.
   c. type of fat (if hyperlipidemic)
   d. % CHO and sodium restriction (if diabetic and/or hypertensive)
   e. other nutrients : potassium, phosphate, calcium and vitamin/mineral (as appropriate per laboratory values)
   f. fluids (as appropriate per mode of dialysis)

3. Patient education
   a. Discuss laboratory values and significance of results
   b. Discuss basic nutrition guidelines for dialysis: adequate protein and energy intake, prevention of malnutrition.
   c. Educate on increased protein needs compared to pre-dialysis when on HD and CAPD.
   d. Provide meal plan and suggestions on appropriate foods to meet energy needs
   e. Provide protein portion sizes as per recommendation
   f. Provide examples of foods for other relevant nutrients (fats, CHO, sodium, phosphate, potassium if appropriate)
   g. Discuss use and timing of phosphate binders
   h. Discuss dry weight and fluid control, if appropriate.
   i. Discuss meal timings and snacks (if diabetic)
   j. Discuss physical activity recommendations to improve muscle mass.
   k. Discuss change of unhealthy habits such as smoking & alcohol intake (if relevant)
   l. Provide relevant diet sheets and food lists.

4. Documentation and follow-up plan
   a. Provide documentation to physician and other health care team members according to individual's hospital policy
   b. Provide timeline for follow-up with patient
   c. Requests that patient records daily food or fluid intake for follow-up assessment, if possible

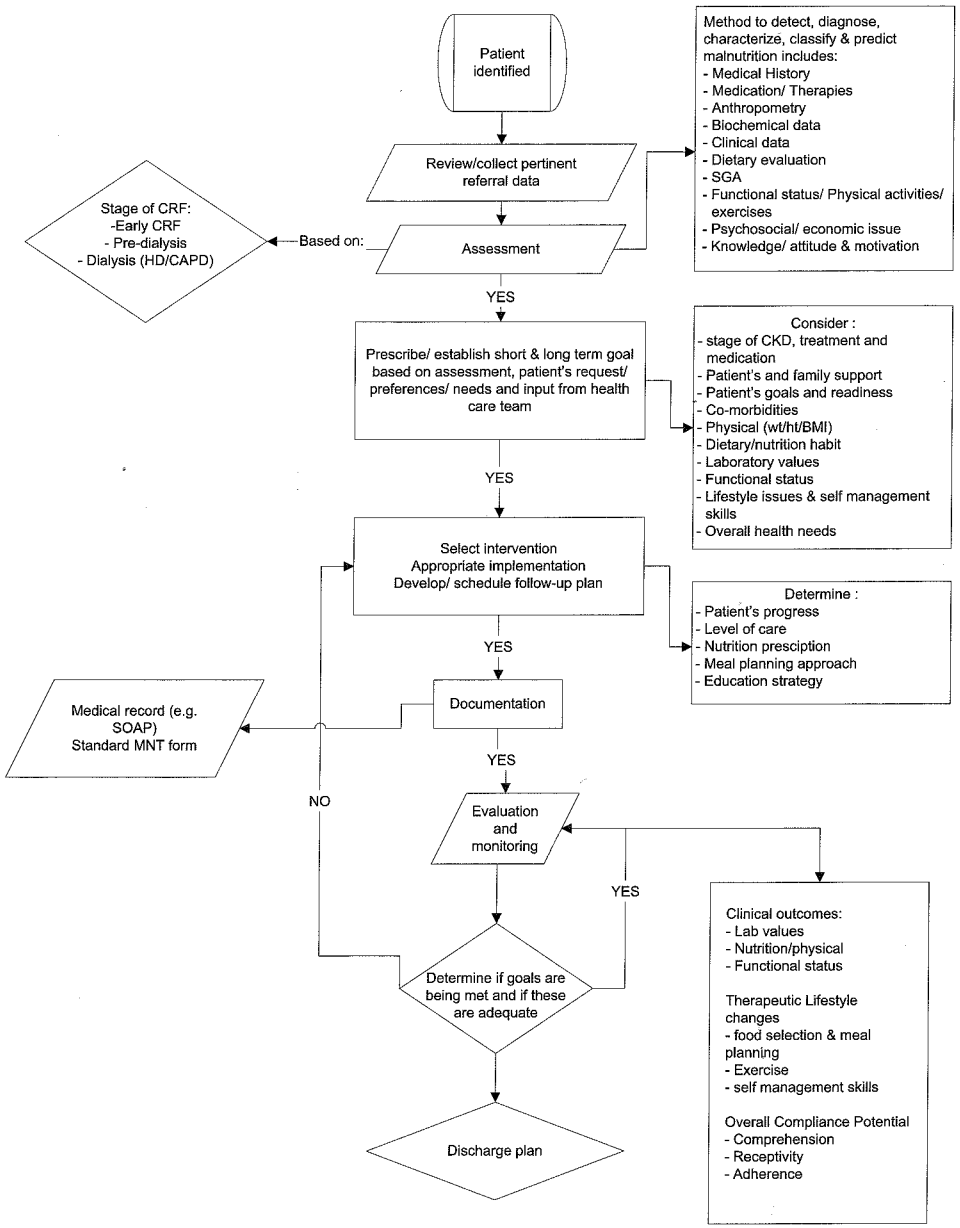
Follow-up visits – 3-6 monthly intervals (30 to 45 minutes)

1. Review clinical data
   a. Changes in medical status and therapy/medications
   b. Changes in biochemical profile
   c. Changes in weight, muscle, fat stores
   d. Changes in dry weight and interdialytic weight (for HD)
   e. Review dialysis adequacy (Kt/V, nPCR)
   f. Physical signs of malnutrition / nutrient deficiencies
   g. Blood sugar , blood pressure control (if appropriate)

2. Review dietary intake based on food records, if done
   a. Assess appropriateness of calories, protein and other relevant nutrients.
   b. Assess changes in patient's appetite, GI symptoms and food habits.
   c. Assess meal plan, food choices and portions

3. Review understanding of previous dietary advice, medications, lab values
4. Review understanding of protein portion sizes, fluid control, intake of phosphate binders
5. Review energy intake and suggest ways to meet requirements.
6. Identify problem foods and suggests appropriate changes for intake of phosphate, potassium and sodium
7. Review meal timings and snacks (if diabetic)
8. Review lifestyle habits – smoking, alcohol intake (if relevant)
9. Review changes in functional ability and activity level
10. Review and reinforce basic dietary guidelines
11. Discuss eating out food choices, appropriate recipe and food preparation modifications , food labels
12. Determine willingness and ability to make further changes
13. Documentation

NUTRITION CARE PROCESS SUMMARY



SPECIAL TOPICS

A. Vegetarian diets

Classification of Vegetarian Diets :

Vegetarians in Malaysia can be grouped into Indian vegetarians and Chinese vegetarians. Indian-styled vegetarianism includes various dhals and legumes incorporated into gravies, stews and snacks and consumption of milk and milk-products such as yoghurt. Chinese-styled vegetarianism includes tofu, textured vegetable proteins (meat analogues) and soya milk.

Caution:

Vegetarian diets may not meet protein adequacy. Vegetarians may also face problems of controlling potassium, phosphorous and sodium.

Guidelines for Planning Vegetarian Renal Diets

Vegetarians should consume a wide variety of plant foods such as cereals (rice, noodles, bread and other products), legumes (soya products such as tofu, tempeh, fucok, meat analogues and various types of dhal), nuts and seeds, fruits and vegetables. Some vegetarians do consume milk and eggs and this should be considered when planning the patient's diet. Consider also that cereal foods will contribute a substantial amount of protein in the vegetarian diet.

- Individualize the meal pattern according to food habits, beliefs, food preferences and type of vegetarianism followed
- Vegetarians with kidney failure can be advised how to optimise their vegetarian sources of protein to achieve requirements.
- It is not necessary for non-vegetarians to become vegetarian due to kidney failure
- Adjust the number of servings and portion sizes of legumes, nuts and seeds due to their high potassium and phosphorus content. Tofu may be used to meet daily protein requirements.
- If more legumes and nuts are eaten by the patient, control potassium intake by choosing lower potassium fruits and vegetables.
- Textured vegetable protein (TVP) foods or meat analogues may also contain sodium either as salt or monosodium glutamate as flavouring agents. Reading of labels is advisable when planning the use of TVPs.
- It is not necessary to complement amino acids from specific foods at each meal to achieve complete protein.
- Vegetarians are more prone on trying alternative therapies, thus herbal medications derived from roots, leaves and juices of high potassium plant foods should be cautioned
- Monitor for adequate calorie intake and where malnutrition is prevalent consider the use of oral nutritional supplements.

B. Nutrition support in CKD

Nutrition support is indicated in kidney failure patients (non-dialysis and dialysis) who are unable to meet protein and energy requirements with food intake for an extended period of time (K/DOQI 2003).

Before considering nutrition support, a complete nutrition assessment should be done. Oral diet may be supplemented with energy and protein supplements and if it is inadequate, enteral nutrition /tube feedings can be initiated if medically appropriate. Some special considerations when initiating enteral nutrition in CKD patients (K/DOQI 2003) are:

a. Moderate protein and electrolyte levels plus added fiber products may be given. Avoid giving products with too high protein content which add to risk of dehydration, hypernatremia and azotemia in patients who are elderly and those with compromised kidney function.
b. Concentrate formulas to minimize fluid overload. Patient may not tolerate the usual flush volumes suggested by the manufacturer. Monitor fluid status carefully.
c. Monitor blood levels of urea and electrolytes/minerals. Phosphate binders may need to be withheld if refeeding syndrome occurs.

d. Choose formulas carefully as some products may have inappropriate levels of vitamin, minerals, electrolytes, protein and calories. If renal formulas are used as sole source of nutrition, monitor for low levels of minerals and electrolytes.

Intradialytic parenteral nutrition (IDPN) for hemodialysis patients may be considered if there is evidence of protein and energy malnutrition, inability to administer sufficient oral nutrition (including oral supplements and enteral feeding). IDPN combined with oral or enteral intake can meet nutritional needs. However, additional research is needed to document the absolute benefit of IDPN (K/DOQI 2000).

C. Use of herbal supplements

In general , use of medicinal herbs can be dangerous and not advisable for CKD patients. Medical herbs can have potent pharmacological activity, questionable chemical components , microbial contamination and effects that interfere with conventional medications. Some of the side-effects of these herbs are shown below:

Herb	Use	Comments/effects
Ginseng	Multiple; stress, memory, strength	Can create anxiety, increased blood pressure, hypoglycemia, decreased anti-coagulant activity, insomnia, headaches, asthma attacks. Do not use in CKD.
Garlic	Cardiac/reduce lipid levels	Side effects: bad breath, gastritis, impaired blood clotting, can affect insulin & oral hypoglycemic drugs
Gingko biloba	Memory, concentration	Headache, anxiety, restlessness, diarrhea, anorexia

Ref : McCann (2002).

D.Diabetics with kidney failure.

Diabetic patients account for 50% of new CKD patients in the country (11th Malaysian Dialysis & Transplant Registry 2003). Patients with diabetes tend to have a higher risk for malnutrition and two-times higher risk of death compared to non-diabetics. Diabetics have also been shown to have a poorer quality of life and rehabilitation.

Strict control of blood sugar is important in diabetes nephropathy and pre-ESRD. During renal replacement therapy, emphasis must be given to prevent malnutrition in diabetics and improve dialysis survival. Hyperglycemia is more prevalent in CAPD patients compared to hemodialysis. Nevertheless, control of blood sugar is important in patients to limit the production of advanced glycosylation end-products (AGEs) which increases vascular complications (Miles & Friedman, 1996). Guidelines for the nutritional management of diabetes should be followed to control blood sugar along with ensuring that renal dietary needs are met.

- Ensure protein and energy intake is adequate to prevent malnutrition.
- Total carbohydrate intake should be monitored and use of simple sugars should be limited to improve glycemic control.
- Ensuring adequate fiber intake may be beneficial to improve glycemic control and prevent constipation. However, phosphate and potassium intake should be monitored especially with the use of whole grain products, beans and legumes.

MAJOR NUTRITION RECOMMENDATION & EVIDENCE LEVEL

Topics	Reference	Year	Grading
Glycemic control and effective treatment of hypertension and proteinuria has been shown to be effective in delaying the onset and progression of chronic kidney disease in patients with both diabetes type 1 and 2. The Diabetes Complications and Control Trial in patients with type 1 diabetes mellitus and the United Kingdom Prospective Diabetes Study in patients with Type 2 diabetes mellitus demonstrated that intensive treatment resulting in near normal A1C reduced the incidence of microabuminuria and diabetic nephropathy.	American Dietetic Association	2002	A (Systemic review)
HD patients who have higher BMI have better survival rates at least for the subsequent 12 months	Kopple et al.	1999	B
BMI should not between 25-28 for CKD patients	K/DOQI	2003	C
Patients with a GFR < 60 ml/min/1.73 m^2 should undergo a nutrition assessment to evaluate for protein calorie malnutrition followed with appropriate intervention.	American Dietetic Association	2002	A
Nutrition assessment should use combination of methods rather than single measure alone	K/DOQI	2000	C
Serum albumin is valid measure of nutrition status	K/DOQI	2000	B
SGA is a reliable tool for measuring nutrition status in CKD patients	NKF K/DOQI	2000	B
Restriction of protein intake from the diet of 0.8 g/kg/ day leads to less albuminuria in diabetic patients	American Dietetic Association	2002	A (Systemic review)
Energy requirement of CKD patients is similar with normal population	Schmeeweiss et al.1990	1990	B
Nitrogen balance studies using < 0.8 g protein/kg/IBW [the Recommended Dietary Allowance (RDA) for protein] reported a neutral or positive nitrogen balance when energy intakes were 35 to 45 kcal/kg/IBW and a negative nitrogen balance when energy intakes were 15 to 25 kcal /kg/IBW.	American Dietetic Association	2002	A (Systemic review)
Dietary sodium restriction helps in sodium balance, control of ECF and hypertension with control of fluid intake	European Guidelines for Nutritional Care of Adult Renal Patients, European Dialysis and Transplantation Nurses Association/ European Renal Care Association. Dietitians Special Interest Group	2002	B

MAJOR NUTRITION RECOMMENDATION & EVIDENCE LEVEL (con't)

Topics	Reference	Year	Grading
Persistent high interdialytic fluid gains and excessive fluid retention increase CVD complication and mortality	Neves et al. 1997. Leggat et al...1998	1997 1998	B
Dietary phosphate restriction results in reduced urinary nitrogen appearance	MDRD 1994;	1994	A
Usage of phosphate binders is effective to lower serum phosphate level	K/DOQI	2000	A (Systemic review)
Hyperphosphatemia treatment needs to be individualized and may include dietary phosphate restriction and/or phosphate binders and calcium and vitamin D supplementation and self management training. Dietary phosphorus intakes are correlated with dietary protein intakes; therefore diets restricted in protein are also lower in phosphorus.	American Dietetic Association	2002	B
Dietary compliance increased with self-monitoring, satisfaction with the diet and feedback (dietary intake from food records and urinary urea nitrogen) and support from the dietitian.	American Dietetic Association	2002	A (Systemic review)

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APPENDIX 1 Estimation of Glomerular Filtration Rate (age 18 & above)

Estimated GFR will usually be sufficient to provide a useful "ballpark" value for the GFR (e.g. < 25 ml/min). The most widely used method for estimating GFR is the Cockcroft-Gault equation. This equation considers the effects of age, sex and body weight on creatinine generation, thereby adjusting serum creatinine values to more accurately reflect creatinine clearance.

GFR = [(140-age) X body weight (kg) X 0.85 if female] divided by
[72 X serum creatinine (mg/dl]

Reference : K/DOQI Guidelines 2000

APPENDIX 2 ARM ANTHROPOMETRICS

Step I Mid-arm circumference (MAC)

1. With the patient standing (if possible) and at post-dialysis weight, measure the circumference of the patient's right or nonaccess arm using a fiberglass tape.
2. For the maximum accuracy, place the patient's forearm across the stomach, measure and mark the midpoint between the acromial and olecranon processes.
3. Have the patient relax the arm at his or her side and measure the arm circumference at the mark without compressing the soft tissue. Record to the nearest 0.1 cm.

Step II Tricep skinfold (TSF)

1. With the patient's arm relaxed at his or her side, pick up or lightly pinch a lengthwise double fold of skin with a thumb and forefinger just above the marked midpoint. Have the patient open and close the fist to ensure that none of the muscle is included in the pinch.
   Note: It may be easiest to start the pinch below the midpoint and work the fingers up to the mark.
2. Hold the calipers parallel to the floor, place them over the fat fold at the mark, to a depth approximately equal to the width of the fat fold. Release calipers while holding the pinch, and take the reading within 3 seconds. Repeat three (3) times and record the average.

Step III Mid arm muscle circumference (MAMC)

Calculate as follow: MAMC = MAC – (TSF X 0.314)

Step IV Mid-upper arm muscle area (MAMA)

Calculate as follows: MAMA = $(MAMC)^2/12.56$

Step V Evaluation

1. Compare values to reference standards and record the percent of standard
2. Use the patient as his or her own standard in subsequent measurements.

Note: Measurements on significant maintenance dialysis population showed few differences from the NHANES II norms.

References: Nelson E: Anthropometry in the Nutritional Assessment of Adults with ESRD. J Ren Nutr 1:162-172, 1991.

APPENDIX 3: REFERENCE VALUES FOR ANTHROPOMETRICS

REFERENCE VALUES FOR THE TRICEPS SKINFOLD THICKNESS (mm) – Male

Age Group	Percentile								
Years	5	10	15	25	50	75	85	90	95
15-15.9	5.0	5.0	5.0	6.0	7.5	11.0	15.0	18.0	23.5
16-16.9	4.0	4.0	5.1	6.0	8.0	12.0	14.0	17.0	23.0
17-17.9	4.0	4.0	5.0	6.0	7.0	11.0	13.5	16.0	19.5
18-24.9	4.0	4.0	5.5	6.5	10.0	14.5	17.5	20.0	23.5
25-29.9	4.0	4.0	6.0	7.0	11.0	15.5	19.0	21.5	25.0
30-34.9	4.5	4.5	6.5	8.0	12.0	16.5	20.0	22.0	25.0
35-39.9	4.5	4.5	7.0	8.5	12.0	16.0	18.5	20.5	24.5
40-44.9	5.0	5.0	6.9	8.0	12.0	16.0	19.0	21.5	26.0
45-49.9	5.0	5.0	7.0	8.0	12.0	16.0	19.0	21.0	25.0
50-54.9	5.0	5.0	7.0	8.0	11.5	15.0	18.5	20.8	25.0
55-59.9	5.0	5.0	6.5	8.0	11.5	15.0	18.0	20.5	25.0
60-64.9	5.0	5.0	7.0	8.0	11.5	15.5	18.5	20.5	24.0
65-69.9	4.5	4.5	6.5	8.0	11.0	15.0	18.0	20.0	23.5
70-74.9	4.5	4.5	6.5	8.0	11.0	15.0	17.0	19.0	23.0

REFERENCE VALUES FOR THE TRICEPS SKINFOLD THICKNESS (mm) – Female

Age Group	Percentile								
Years	5	10	15	25	50	75	85	90	95
15-15.9	8.0	9.5	10.5	12.0	16.5	20.5	23.0	26.0	32.5
16-16.9	10.5	11.5	12.0	14.0	18.0	23.0	26.0	29.0	32.5
17-17.9	9.0	10.0	12.0	13.0	18.0	24.0	26.5	29.0	34.5
18-24.9	9.0	11.0	12.0	14.0	18.5	24.5	28.5	31.0	36.0
25-29.9	10.0	12.0	13.0	15.0	20.0	26.5	31.0	34.0	38.0
30-34.9	10.5	13.0	15.0	17.0	22.5	29.5	33.0	35.5	41.5
35-39.9	11.0	13.0	15.5	18.0	23.5	30.0	35.0	37.0	41.0
40-44.9	12.0	14.0	16.0	19.0	24.5	30.5	35.0	37.0	41.0
45-49.9	12.0	14.5	16.5	19.5	25.5	32.0	35.5	38.0	42.5
50-54.9	12.0	15.0	17.5	20.5	25.5	32.0	36.0	38.5	42.0
55-59.9	12.0	15.0	17.0	20.5	26.0	32.0	36.0	39.0	42.5
60-64.9	12.5	16.0	17.5	20.5	26.0	32.0	35.5	38.0	42.5
65-69.9	12.0	14.5	16.0	19.0	25.0	30.0	33.5	36.0	40.0
70-74.9	11.0	13.5	15.5	18.0	24.0	29.5	32.0	35.0	38.5

Adapted: Frisancho AR: Anthropometrc Standards for the Assessment of Growth and Nutritional Status. The University of Michigan Press, 1993

REFERENCE VALUES FOR MID-ARM CIRCUMFERENCE (cm)

Age Group		Percentile						
	Years	5	10	25	50	75	90	95
M	18-24	23.5	24.4	25.8	27.2	28.9	30.8	32.3
A	25-34	24.2	25.3	26.5	28.0	30.0	31.7	32.9
L	35-44	25.0	25.6	27.1	28.7	30.3	32.1	33.0
E	45-54	24.0	24.9	26.5	28.1	29.8	31.5	32.6
	55-64	22.8	24.4	26.2	27.9	29.6	31.0	31.8
	65-74	22.5	23.7	25.3	26.9	28.5	29.9	30.7
F	18-24	17.7	18.5	19.4	20.6	22.1	23.6	24.9
E	25-34	18.3	18.9	20.0	21.4	22.9	24.9	26.6
M	35-44	18.3	19.2	20.6	22.0	24.0	26.1	27.4
A	45-54	18.8	19.5	20.7	22.2	24.3	26.6	27.8
L	55-64	18.6	19.5	20.8	22.6	24.4	26.3	28.1
E	65-74	18.6	19.5	20.8	22.5	24.4	26.5	28.1

Reference: Bishop CW, et al: Norms for Nutritional Assessment of American Adults by Upper Arm Anthropometry. Am J of Clin Nutr 34:347, 1982

REFERENCE VALUES FOR MID-UPPER ARM MUSCLE AREA (cm^2) – Male

Age Group	Percentile								
Years	5	10	15	25	50	75	85	90	95
15-15.9	31.9	34.9	36.9	40.3	46.3	53.1	56.3	65.7	63.0
16-16.9	37.0	40.9	42.4	45.9	51.9	57.8	63.6	66.2	70.5
17-17.9	39.6	42.6	44.8	48.0	53.4	60.4	64.3	67.9	73.1
18-24.9	34.2	37.3	39.6	42.7	49.4	57.1	61.8	65.0	72.0
25-29.9	36.6	39.9	42.4	46.0	53.0	61.4	66.1	68.9	74.5
30-34.9	37.9	40.9	43.4	47.3	54.4	63.2	67.6	70.8	76.1
35-39.9	38.5	42.6	44.6	47.9	55.3	64.0	69.1	72.7	77.6
40-44.9	38.4	42.1	45.1	48.7	56.0	64.0	68.5	71.6	77.0
45-49.9	37.7	41.3	43.7	47.9	55.2	63.3	68.4	72.2	76.2
50-54.9	36.0	40.0	42.7	46.6	54.0	62.7	67.0	70.4	77.4
55-59.9	36.5	40.8	42.7	46.7	54.3	61.9	66.4	69.6	75.1
60-64.9	34.5	38.7	41.2	44.9	52.1	60.0	64.8	67.5	71.6
65-69.9	31.4	35.8	38.4	42.3	49.1	57.3	61.2	64.3	69.4
70-74.9	29.7	33.8	36.1	40.2	47.0	54.6	59.1	62.1	67.3

REFERENCE VALUES FOR MID-UPPER ARM MUSCLE AREA (cm^2) – Female

Age Group	Percentile								
Years	5	10	15	25	50	75	85	90	95
15-15.9	24.4	25.8	27.5	29.2	33.0	37.3	40.2	41.7	45.9
16-16.9	25.2	26.8	28.2	30.0	33.6	38.0	40.2	43.7	48.2
17-17.9	25.9	27.5	28.9	30.7	34.3	39.6	43.4	46.2	50.8
18-24.9	19.5	21.5	22.8	24.5	28.3	33.1	36.4	39.0	44.2
25-29.9	20.5	21.9	23.1	25.2	29.4	34.9	38.5	41.9	47.8
30-34.9	21.1	23.0	24.2	26.3	30.9	36.8	41.2	44.7	51.3
35-39.9	21.1	23.4	24.7	27.3	31.8	38.7	43.1	46.1	54.2
40-44.9	21.3	23.4	25.5	27.5	32.3	39.8	45.8	49.5	55.8
45-49.9	21.6	23.1	24.8	27.4	32.5	39.5	44.7	48.4	56.1
50-54.9	22.2	24.6	25.7	28.3	33.4	40.4	46.1	49.6	55.6
55-59.9	22.8	24.8	26.5	28.7	34.7	42.3	47.3	52.1	58.8
60-64.9	22.4	24.5	26.3	29.2	34.5	41.1	45.6	49.1	55.1
65-69.9	21.9	24.5	26.2	28.9	36.6	41.6	46.3	49.6	56.5
70-74.9	22.2	24.4	26.0	28.8	34.3	41.8	46.4	49.2	54.6

Adapted: Frisancho AR: Anthropometrc Standards for the Assessment of Growth and Nutritional Status. The University of Michigan Press, 1993

APPENDIX 4 : SUBJECTIVE GLOBAL ASSESSMENT (SGA) SCORING SHEET

Patient Name : _____ RN : _____
Date:_____

Part 1: Medical History

		A	B	C
1. Weight Change				
Current Weight : _____kg Height: _____cm				
A. Overall loss in past 6 months = _____kg = _____%				
B. Percentage change:				
_____ gain -< 5%loss	(A)			
_____ 5-10 % loss	(B)			
_____ > 10 %	(C)			
C. Change in past 2 weeks				
_____ increase	(A)			
_____ no change	(B)			
_____ decrease	(C)			
2. Dietary Intake				
A. Overall change:				
_____ no change				
_____ change				
B. Duration				
_____ weeks				

		A	B	C
C. Type of change				
_____ soft diet *(adequate intake)*	(A)			
_____ fluid liquid diet *(complete liquid)*	(A)			
_____ hypocaloric/ inadequate intake *(e.g. liquid/soft/solid)*	(B)			
_____ starvation *(cannot swallow)*	(C)			
3. Gastrointestinal Symptoms *(persisting for > 2 weeks)*				
_____ none	(A)			
_____ nausea	(B)			
_____ vomiting *(daily or twice daily)*	(C)			
_____ diarrhea *(>5 times daily)*	(C)			
_____ anorexia *(no appetite)*	(C)			
4. Functional impairment *(nutritionally related)*				
A. Overall impairment				
_____ none	(A)			
_____ working suboptimally *(still able to work)*	(A)			
_____ ambulatory *(can walk to toilet)*	(B)			
B. Change in past 2 weeks:				
_____ bedridden	(C)			
_____ improved	(A)			
_____ no change	(B)			
_____ regressed	(C)			

		Normal	Mild	Moderate	Severe
5. Disease and its relation to nutritional requirements					
Primary diagnosis *(specify)*: _____					
Metabolic demand *(stress)*:					
(to refer normogram)					
_____ no stress	(A)				
_____ low stress *(0-25 % including malignancy)*	(B)				
_____ moderate stress *(25-55 %)*	(B)				
_____ high stress *(> 55 %)*	(C)				

Part 2: Physical examination

6. Evidence of loss of subcutaneous fat *(triceps, chest)*
   muscle wasting *(quadriceps, deltoids)*
   ankle edema
   sacral edema
   ascites

Part 3: SGA rating ***(check#)***

A ☐ Well-Nourished

B ☐ Mildly-Moderately Malnourished

C ☐ Severely Malnourished

* Derived from Detsky et. al 1987 JPEN 1:8-13

See text for further description of designation of classes

Class A : Indication those with less than 5 % weight loss more than 5 % but recent gain and improvement in appetite

Class B : Those with 5 % to 10 % weight loss without recent stabilization or gain, poor dietary intake, and mild loss of subcutaneous tissue.

Class C : Ongoing weight loss of more than 10% with severe subcutaneous tissue loss and muscle wasting often with edema.

Physical Examination: What to look for …..				
	Special Tips	**Severe Malnutrition**	**Mild-to-Moderate Malnutrition**	**Well Nourished**
Subcutaneous Fat				
Below the eye		Hollow look, depression, dark circles, loose skin		A lightly bulged fat pads
Triceps/Biceps	Arm bent; be careful not to include muscle in pinch, roll skin between fingers	Very little space between fingers, or fingers touch		Ample fat tissue
Muscle Wasting				
Temple	Observe straight on; have pt. Turn head to side	Hollowing, depression	Slight depression	Can see well-defined muscle
Clavicle	Look for prominent bone	Protruding/ prominent bone	Some protrusion	Not visible in males, may be visible but not prominent in females
Shoulder	Arms at side; look for prominent bones, shape	Shoulder-to-arm joint look square, bones prominent	Acromium process may protrude slightly	Rounded; curves at junction of shoulder & neck or arm
Scapula	Look for prominent bones; have pt. Push hands against solid object	Prominent, visible bone, depressions between ribs, scapula & shoulder or spine	Mild depressions or bone may show slightly	Bones not prominent; no significant depressions
Interrosseous muscle	Back of hand; move thumb and forefinger back & forth	Flat or depressed area between thumb & forefinger	Slight depressed or flat	Muscle protrudes; could be flat in well-nourished females
Knee *(note: lower body is less sensitive to change)*	Have pt. Sit with leg propped up on low stool	Bone prominent		Muscle protrudes; bone not prominent
Quadriceps	Not as sensitive an indicator as upper body	Depression on inner thigh; obviously thin	Mild depression on inner thigh; thin	Well rounded; no depression

Physical Examination: What to look for …..				
	Special Tips	**Severe Malnutrition**	**Mild-to-Moderate Malnutrition**	**Well Nourished**
Subcutaneous Fat				
Calf		Thin; no muscle definition		Well-developed bulb
Edema/Ascites				
	Try to R/O causes other than malnutrition; check ankle for mobile pt., sacrum for activity-restricted pt.	Significant swelling	Mild-to-moderate swelling	No sign of fluid accumulation

APPENDIX 5 CONVERSION FORMULAS

mg to mEq or mEq to mg "Traditional to System International (SI) Unit

$$mEq = \frac{mg \times valence}{atomic\ weight}$$

Traditional X Conversion Factor = SI

$$mg = \frac{mEq \times atomic\ weight}{valence}$$

	Symbol	**Atomic Wt**	**Valence**		**Traditional**	**Factor**	**SI**
Calcium	Ca^{2+}	40	2	**Albumin**	g/dL	10	g/L
Chloride	Cl^-	35	1	**BUN**	mg/dL	0.357	mmol/L
Iron	Fe^{2+}	56	2	**Calcium**	mg/dL	0.250	mmol/L
Magnesium	Mg^{2+}	24	2	**Chloride**	mEq/L	1.0	mmol/L
Phosphorus	P	31	2	**Cholesterol**	mg/dL	0.026	mmol/L
Potassium	K^+	39	1	**Creatinine**	mg/dL	88.4	mmol/L
Sodium	Na^+	23	1	**Glucose**	mg/dL	0.055	mmol/L
				Magnesium	mEq/L	0.5	mmol/L
				Phosphate	mg/dL	0.323	mmol/L
				Potassium	mEq/L	1.0	mmol/L
				Sodium	mEq/L	1.0	mmol/L
				Total Protein	g/dL	10	g/L

Reference: Hunt K: SI Unit Conversion. J Ren Nutr 3(3): 146-147, 1993

Appendix 6 : Five-Item INSTRUMENTAL ACTIVITIES OF DAILY LIVING
Screening Questionnaire

Name:_____ **Date:**_____

Can you get to places out of walking distance:

1 = Without help *(can travel alone on bus or taxi, or drive own car)*
0 = With some help *(need someone to help you or go with you when traveling)* or unable to travel unless emergency arrangements are made for a specialized vehicle such as an ambulance.
= Not answered

____

Can you go shopping for groceries or clothes ***(assuming you have transportation)*****:**

1 = Without help *(taking care of all your shopping needs yourself, assuming you have transportation).*
0 = With some help *(need someone to go with you on all shopping trips),* or completely unable to do any shopping.
= Not answered

_____

Can you prepare your own meals:

1 = Without help *(plan and cook meals yourself)*
0 = With some help *(can prepare some things but unable to cook full meals yourself),* or completely unable to prepare any meals
= Not answered

_____

Can you do your housework:

1 = Without help *(can scrub floors, etc)*
0 = With some help *(can do light housework but need help with heavy work),* or unable to do any housework
= Not answered

_____

Can you handle your own money:

1 = Without help *(write checks, pay bills, etc)*
0 = With some help *(manage day to day buying but need help with managing checkbook and paying bills),* or completely unable to handle money
= Not answered

_____

Total Score:_____(0-5)

Scoring Scale: On a scale of 0-5, 5 reflects independence in IADLs, 0 reflects dependence in IADLs. Use scoring to compare change in IADLs over time.

Source: Reprinted with permission from G Fillenbaum, Screening the elderly: a brief instrumental activities of daily living measure. J Am Geriatr Soc. 1985; 33:698-706.

Appendix 7: Kidney DETERMINE Nutrition Awareness Checklist
for Health Care Professionals

Name:_____ **Date:**_____

Use this checklist to determine whether your patient may have a nutrition related problem. Do not overlook the warning signs of poor nutrition.

Read the statements below to your patient. Place a √ in the yes column if the statement applies to the patient. Place a ? in the no column if it does not apply to the patient. If your patient has a nutrition related problem, you can use the Kidney DETERMINE Nutrition Screening Reference Sheets to determine what the appropriate interventions are to help the patient resolve the problem.

	Yes	No
In addition to your kidney disease, do you have one or more of these problems, High blood pressure, high blood cholesterol, diabetes, heart disease, or stomach problems? *(Circle those that apply to the patient)*		
Do you have mouth, chewing, or swallowing problems that make it hard for you to eat?		
Do you have problems with your medications?		
Do you forget to take your medications more than two times a week?		
Without wanting to, have you lost 10 pounds in the last 6 months?		
Are you following a special diet?		
Do you have questions or problems with your special diet?		
Do you have a poor appetite?		
Does food not taste good to you?		
Do you eat fewer than 2 meals per day?		
Are you ever too tired to cook or eat?		
Do you have trouble paying for the food, medications or medical care that you need?		
Do you eat alone most of the time?		

Reference : Leung J, Dwyer J. Renal DETERMINE Nutrition Screening Tools for the Identification and Treatment of Malnutrition. J Renal Nutr. 1998; 8:95-103.

APPENDIX 8 : ESTIMATION OF IDEAL BODY WEIGHT

Ideal body weight is used to calculate individual requirements for energy, protein and other nutrients. Therefore it is important to standardize the method of estimating IBW. The measurement of body weight is complicated by the accumulation of fluids. Therefore, estimation of actual body weight should take into account the degree of fluid overload or depletion. This should be assessed with the help of an experienced nephrologist.

- IBW will be estimated from an accurate measure of height and weight using the BMI
- BMI will be calculated using the following formula: BMI = weight (kg)/height^2 (m)
- For those patients who are underweight (BMI < 20) IBW is estimated as a weight equivalent to BMI 20. For those patients who are overweight (BMI >25) IBW is estimated as a weight equivalent to BMI 25
- Example calculation of IBW:
  i) Dry weight = 60 kg, Height = 1.65 m. BMI = 60/1.65^2 = 22
  BMI is between 20-25, therefore IBW = actual weight = 60 kg
  ii) Dry weight = 95 kg, Height = 1.65 m. BMI = 95/1.65^2 = 36
  BMI > 25, therefore IBW = BMI 25 = 68 kg

Reference : CARI Guidelines (2002)

APPENDIX 9: ESTIMATES OF CALORIES ABSORBED FROM PERITONEAL DIALYSATE

Reference	Formula	Example	Comment
Simple estimate	Glucose infused X 60 % absorption (CAPD) 1.5 % 1L = 15 g X 3.4 = 51 X 60 % =31 kcal/L 2.5 % 1L = 25 g X 3.4 = 85 X 60 % =51 kcal/L 4.25 % 1L = 42.5 g X 3.4 = 144.5 X 60 % = 86.7 kcal/L	4L, 1.5 % = 124 4L, 4.25 % = 346 **Total kcal = 470 per day**	Rough estimate; doesn't consider membrane transport characteristics

Reference : McCann L.(ed) Pocket Guide to Nutrition Assessment of the Patient with Chronic Kidney Disease, National Kidney Foundation 2002

APPENDIX 10 : EXAMPLES OF LOW PROTEIN CEREALS SUITABLE FOR CKD

The following foods may be useful to be incorporated into a low protein diet to help meet energy requirements.

NAME OF FOOD	SERVING SIZE	WT (g)	CALORIE (Kcal)	PROTEIN (gram)	CARBOHYDRATE (gram)
Sago noodles (Tang Hoon / Soh-hun)	1 cup	31	103	0.0	25.7
Sago, pearl	1 Tbsp	11	37	0.0	9.3
Marie Biscuit	1 piece	7	32	0.5	5.7
Cream Crackers Biscuit	1 piece	9	40	0.8	6.8
Lo-see-fun	1 cup	141	177	0.8	42.5
Putu mayam	1 piece	50	95	1.4	19
Bread, white	1 slice	19	48	1.8	9.8
Rice	1 cup	128	167	2.9	38.5
Kuih teow	1 cup	108	150	3.2	34.3
Mee	1 cup	109	225	4.9	49.4
Mee-hoon	1 cup	53	184	5.9	40.2

Ref : Tee at al. Malaysian Food Composition Table (1997)

APPENDIX 11 : CLINICAL SIGNS OF FLUID STATUS IN DIALYSIS PATIENTS

Fluid Overload	Dehydration
Gain > 5 % dry weight	Minimal weight gain/weight loss between treatments
Hypertension (increase blood pressure especially pre-dialysis)	Hypotension/orthostatic fall in blood pressure
Peripheral edema, shortness of breath	Decreased skin turgor
Left ventricular failure with rales in lungs, labored breathing while supine, third heart sound	Collapsing veins/difficult venipuncture. Cool extremities
Dilution of the serum can cause some laboratory values to be falsely low *(e.g. albumin, sodium & HbA1c)*	Concentration of the serum can cause some laboratory values to be falsely high *(e.g. hematocrit, sodium)*

APPENDIX 12: DRUGS THAT MAY IMPAIR ABSORPTION OR UTILIZATION OF NUTRIENTS

Drug-nutrient interactions depend on the drug dose and timing of administration. Multiple drugs may have simultaneous and compounding effects. Phosphate binders/calcium supplements can affect and/or be affected by many drugs and should be taken away from other medications if at all possible. Bicarbonate administration reduces folate and iron absorption.

Drug	Nutrient
Alcohol	Increase excretion of Mg2+, K+, zinc, impaired utilization of folic acid
Antibiotics : Cycloserine	Decrease level of B12, B6, folic acid
Neomycin	Decrease absorption: fat, lactose, protein, vit A, D, K, B12, Ca2+, K+, Fe2+
Isoniazid	Pyridoxine deficiency
Tetracycline	Ca2+, Mg2+, iron, zinc
Tobramycin	Increase urinary loss of K and Mg, hypokalemia
Antacids*	Decrease absorption of phosphorus, Fe2+
Anticoagulants	Decrease vitamin K-dependent coagulation factors
Anticonvulsant:	B12, folic acid, Ca2+, Mg2+, pyridoxine, vit K & D
Phenbarbital	Pyridoxine may increase drug effect
Anti-Gout	Increase excretion of K+, Na+, Ca2+, Mg2+, P, amino acids, chloride, vit B12,
Anti-inflammatory	Folic acid, Na+, K+, fat, vit C, nitrogen, B12
Corticosteroids	Increase protein catabolism/decr synthesis; decr absorption of Ca2+, P, K+: incr need for B6, folate, vit C, D, zinc
Diuretics	Increase urinary excretion of Mg2+, zinc, K+, thiamin
Cholesterol lowering	Decrease absorption: fat, carotene, vit A, D, K, B12, Fe2+
Laxatives	Increase fecal loss of fat, Ca2+, K+, Mg2+, fluids, most vitamins, carotene

References : Mosby's: Nursing Drug Reference, Mosby, 2000 Moore MC: Nutritional Care 4th Ed. Mosby's Pocket Guide Series, 2001 Alpers DH, et al: Manual of Nutritional Therapeutics. Lippincot Williams & Walkins, 2002

APPENDIX 13: An example of levels of vitamin/ mineral supplements given to CKD patients

Vitamin/ mineral	Level
Calcium carbonate	500 mg
Ferum fumarate	200 mg
Folate	5 mg
Vitamin C	50 mg
Vitamin B complex	Aneurin 1 mg Riboflavin 1.5 mg Nicotamide 10 mg
Neurobion	Vitamin B1 100mg B6 200 mg B12 200 mcg
Vitamin D	Alfacalcidol 0.25 mcg Calcitriol 0..25 mcg

Source : Hospital Kuala Lumpur 2004

APPENDIX 14: PHOSPHATE CONTENT OF FOODS

Based on a phosphate allowance of 1000 mg/day and an average of 20 food items eaten in a day, the following classification of foods are derived:

High phosphate content if 8 % (> 80 mg) or more the phosphate allowed in a day is found in a usual serving.
Moderate phosphate content if 4-8 % (40-80 mg) of the phosphate allowed in a day is found in a usual serving
Low phosphate content if less than 4% (< 40 mg) of the phosphate allowed in a day is found in a usual serving

Low (< 40 mg per serving)	Moderate (40-80 mg/serving)	High (> 80 mg/serving)
Beverages Rose syrup drink, 200 ml Tea, plain or Chinese 200 ml Sugar cane water, 200 ml Non-dairy creamer 1 sachet (7 g)	Soyabean drink, 200 ml Cola drinks, 1 tin (325 ml) Cocoa/chocolate powder, 2 tbsp	Teh tarik, 200 ml Coffee with milk, 200 ml
Cereals Yellow mee wet, 1 teacup(90 g) Custard powder, 2 tbsp Corn flour, 2 tbsp Oats, 2 tbsp Wet laksa, 1 teacup(120 g) Kuay teow wet 1 cup (100 g) Mee hoon wet, 1 cup (130 g) Idli, 1 piece (60 g)	Rice, cooked 1 cup(250 g) White bread 2 slices Wholemeal bread , 2 slices Barley, 2 dsp Plain fried mee hoon, 1 plate (400 g) Putu mayam, 1 piece Fish porridge, 1 bowl(270 g) Dosei, plain 1 piece	Instant noodles, 1 packet Macaroni wet, 1 cup (150 g) Lemang, 4 inch piece Nasi lemak, 1 plate (295 g) Rawadosei, 1 piece Roti canai, 1 piece Chappati, 1 piece **Rice and noodles cooked with meat/ chicken/fish/legumes will be high in phosphate**

Low (< 40 mg per serving)	Moderate (40-80 mg/serving)	High (> 80 mg/serving)
Dairy products	Ice-cream, 2 scoops	Cheese, 1 slice Condensed milk, 2 tbsp Full cream milk, 1 glass Skim milk, 1 glass Low fat milk, 1 glass
Vegetables Vegetables are generally low in phosphate content	Spinach, ½ cup Potato, 1 small	Sweet potato, 1 medium Other tubers Dried mushrooms
Fruits Most fruits are low in phosphate content		
Meat, fish, poultry & legume Egg , no yolk Fried groundnuts, 2 tbsp	Egg with yolk, ½ Chicken, roasted 1 thigh Baked beans, ½ cup Ikan bilis, 2 tbsp Dried prawns Dried fish Organ meat/offals	Dhal, ½ cup Most meat, fish and chicken dishes are high in phosphate. **Caution: use of phosphate binders are a must!**
Snacks & spreads Margarine, 1 tsp Jam, 1 tbsp Cream crackers, 2 pieces Sago kueh, 1 piece Apam kueh, 1 piece Fried popiah, 1 piece Karipap, 1 piece	Popcorn, 1 packet (60 g) Muffin, 1 piece Fish/prawn crakers, 6 pieces Fried sweet potato, 1 piece Chocolate biscuits, 4 pieces	Peanut butter, 2 tbsp Butter cake. 1 slice (50 g) Vadai, 1 piece Burger, 1 whole with bread Pau with meat fillings, 1 piece Corn on the cob, 1 piece

Reference : Tilakavati K, Chee WSS & Ruzana A.Developing a nutrition education package for Malaysian Hemodialysis Patients. J Renal Nutr.2001. Vol 11(4): 220-227
Chee WSS & Tilakavati K.. A food phosphate guide for kidney patients. Leo Pharma Asia Ltd.2003.
Tee E.S. et al. Malaysian Food Composition Table.1997.

Tips on teaching patients how to control phosphate intake

1. Since the phosphate content of meals can vary widely, the dose of phosphate binder should be adjusted based on phosphate content of the meal. Occasional high phosphate meals can be eaten together with phosphate binder for that meal. This is especially true for protein foods to help patient meet protein requirements.
2. Advice your patients to avoid eating the cartilage and soft bones of fish, shellfish and meat.
3. Reduce intake of cocoa, chocolate-based beverages and cola drinks.
4. Limit dairy food products such as milk, curd/yogurt and cheese. Use non-dairy creamer to replace milk in beverages.
5. Phosphate binders must be taken with meals. For calcium carbonate, it is best to chew the tablets *(except those in capsules).*
6. If forgotten, phosphate binders can be eaten within 15 minutes after a meal. Otherwise, it should be just left out and the dose should not be doubled at the next meal.
7. Advice patients to bring along their phosphate binders when eating out at all times.

APPENDIX 15: POTASSIUM CONTENT OF FOODS

Based on a potassium allowance of 2000 mg/day and an average of 20 food items eaten in a day, the following classification of foods are derived:

High potassium content if 5 % (> 100 mg) or more the potassium allowed in a day is found in a usual serving

Moderate potassium content if 3-5 % (50-100 mg) of the potassium allowed in a day is found in a usual serving

Low potassium content if less than 3 % (< 50 mg) of the potassium allowed in a day is found in a usual serving

Low (< 50 mg per serving)	Moderate (50-100 mg/serving)	High (> 100 mg/serving)
Beverages Syrup drink, 1glass	Barley water, 1 glass Chinese tea, 1 glass Non-cola beverages, 1 glass Sugar cane juice, 1 glass	Canned fruit juice, 1 glass Cocoa or chocolate based drink, 1 glass Coconut water, 1 glass Fresh fruit juice, 1 glass Malted beverages, 1 glass
Vegetables Bean sprouts/taugeh ½ cup Bitter gourd, ½ cup Leek, ½ cup Cucumber, ½ cup Kangkung, ½ cup Cabbage 1/2 cup Sweet potato leaves, ½ cup White radish, ½ cup Snake gourd, ½ cup Ketola, ½ cup	All varieties of beans (long beans, French beans, broad beans, peas) ½ cup Asparagus, ½ cup Bamboo shoots, ½ cup Brinjal, ½ cup Capsicum, ½ cup Red carrot, ½ cup Cauliflower, ½ cup Lettuce(sang coy), ½ cup Pumpkin, ½ cup Sengkuang, ½ cup Tomato, ½ cup	Banana stem, ½ cup Drumstick leaves (muranggai/kelor), ½ cup Jantung pisang, ½ cup Petai, ½ cup Bayam, ½ cup Sawi, ½ cup Brocolli, ½ cup Ulam, ½ cup Cekur mains, ½ cup Kai lan, ½ cup Tubers (potato, sweet potato, yam, tapioca) 1 cup
Fruits Apple (red or green), 1 whole Pear (lai) , 1 whole Guava, ½ Papaya, 1 slice Watermelon, 1 slice Pineapple, 1 slice Starfruit, 1 small	Canned fruits (minus syrup) ½ cupLime, 1 whole Lemon, 1 whole Lychee (minus syrup), ½ cup Oranges, 1 whole Persimmon, 1 whole Pomelo, Rambutan	Banana, 1 whole Cempedak, Ciku, Durian, Nangka, Grapes, Langsat, Mata kucing, Peach, Plum,
Miscellaneous items that are high in potassium include : All varieties of legumes & pulses *(dhal, chickpea, soya,etc)* All varieties of nuts Spice powder *(serbuk kari, rempah, etc)* Brown sugar Baked beans Fresh grounded chilli/cili boh Chocolate based products Coconut based products Dried fruits Dried mushrooms Dried prawns/ fish Essence of chicken Assam jawa Tempoyak Wholemeal products		

Reference: Karupaiah T, Chee WSS & Ruzana A.Developing a nutrition education package for Malaysian Hemodialysis Patients. J Renal Nutr.2001 Vol 11(4): 220-227

Tips on teaching patients how to control potassium intake

1. Potassium is soluble in water. Cutting vegetables in small pieces and soaking them for 1-2 hours in several changes of warm water will help leach out the potassium content.
2. Drain away liquid from canned fruits and vegetables.
3. Peel off skin from fruits.
4. Use whole rather than ground spices for flavouring.
5. Avoid herbal and traditional remedies such as ginseng roots, banana stem, akar kayu and others.

APPENDIX 16: Sample Documentation Form For Renal Patients

Initial Nutrition Assessment

Date : _____

Time : _____

Name : _____ Age : ____ years

RN : _____

Sex : ☐ Male ☐ Female Race : ☐ Malay ☐ Chinese ☐ Indian ☐ Other

Occupation : _____ ☐ Full time ☐ Part-time ☐ Not working ☐ Unable to work

Attending physician/ Nephrologist : _____

Diagnosis : _____

Co morbid condition : ☐ CVD ☐ Diabetes ☐ HPT
☐ Anemia ☐ Bone Disease ☐ Hyperlipidemia
☐ Cancer ☐ Neuropathy ☐ Others _____

Duration of renal failure: _____ (mo/yr)

Treatment : ☐ Non-dialysis ☐ Dialysis ☐ HD ☐ PD (CAPD/IPD) Insulin (if any) : _____

Prescribed Medication : _____

Prescribed Vitamins /Minerals: ☐ Yes ☐ No _____

Previous dietary advice : ☐ Yes ☐ No if yes; what, where, when :

Lifestyle Pattern

Smoking : ☐ Yes ☐ No if yes, _____ sticks/day

Alcohol : ☐ Yes ☐ No if yes, _____ intake/week

Physical activity : ☐ Sedentary ☐ Moderate ☐ Active

Doing exercise : ☐ Yes ☐ No Type/duration : _____

Any restriction regarding exercise : ☐ Yes ☐ No

Functional status : ☐ Independent ☐ Dependant

PART I (Nutritional Assessment)

Anthropometrics

Height : ____cm Present wt: _____ kg Dry wt : _____kg Interdialytic wt gain : ___ kg

BMI : _____kg/m2 ☐ Underwt ☐ N ☐ Overwt ☐ Obesity IBW : ___ kg

History of recent weight changes : ☐ No ☐ Yes ___ kg/% Duration of losses:_____

Triceps skin fold : _____

Clinical Data

Presence of Edema : ☐ Yes ☐ No

Physical sign of nutrient deficiencies: ☐ Yes ☐ No

SGA Rating: ☐ A ☐ B ☐ C Patient : ☐ Malnourish ☐ Well nourish

---

Dietary Evaluation & Lifestyle Changes

Current Food

☐ Normal ☐ Enteral Feeding
☐ Therapeutic diet ☐ Parenteral Nutrition

Difficulty with present diet:

_____

Approximate dietary intake :

Energy : _____ kcal Protein : _____ g % HBV : _____ %

Fat : _____ g Sat fat : _____ g Chol : _____ g

CHO : _____ g Fluids : _____ ml

Refine sugar : ☐ High ☐ Moderate ☐ Low

Natrium : ☐ High ☐ Moderate ☐ Low

Phosphorus : ☐ High ☐ Moderate ☐ Low

Potassium : ☐ High ☐ Moderate ☐ Low

Overall Adequacy of intake : _____

Supplements/Herbals/Botanicals intake : _____

Any food allergies/aversion: _____

Appetite : ☐ Excellent ☐ Good ☐ Fair ☐ Poor

GI problems : ☐ Normal ☐ Constipation ☐ Diarrhea ☐ Abdominal distention

Digestion Difficulties : ☐ LOA ☐ Nausea ☐ Vomiting ☐ Swallowing/Chewing

---

Diet History/ Food record

Breakfast	Lunch	Dinner
Snack	**Snack**	**Snack**

Checklists :

Protein (HBV/LBV)	Sodium	High Potassium	High Phosphate

PART II: MNT GOALS

Nutritional Requirement

Energy : _____ kcal Protein : _____ g % HBV : ___ %

Fat : _____ g Fluids : _____ ml

CHO : ____ g

Refine sugar : ☐ Limit ☐ Allowed

Natrium : ☐ Limit ☐ Allowed

Potassium : ☐ Limit ☐ Allowed

Phosphorus : ☐ Limit ☐ Allowed

Diet Prescribed :

Type of Diet : _____

Supplementation : ☐ Oral Supplement ☐ Enteral Feeding ☐ None

Product/ Regimen : _____

Diet Explanation

☐ Provide rationale for role of diet in slowing progression of renal disease

☐ Provide rationale on good control of diabetes and hypertension *(if appropriate)*

☐ Discuss lab values and significance of results

☐ Discuss basic nutrition guidelines for ESRD : adequate protein , adequate energy intake, prevention of malnutrition.

☐ Educate on increased protein needs compared to pre-dialysis when on HD and CAPD.

☐ Provide protein portion sizes as per recommendation

☐ Provide meal plan and suggestions on appropriate foods to meet energy needs

☐ Discuss dry weight and fluid control *(if appropriate)*

☐ Provide examples of foods for other relevant nutrients *(fats, CHO, sodium, phosphate, etc. if appropriate)*

☐ Discuss use and timing of phosphate binders *(if relevant)*

☐ Discuss meal timings & snacks *(if diabetic)*

☐ Discuss physical activity recommendations, if appropriate

☐ Discuss change of unhealthy habits such as smoking & alcohol intake *(if relevant)*

☐ Provide relevant diet sheets and food lists, if needed and available

Patient compliance /comprehension/receptivity: ☐ Excellent ☐ Good ☐ Fair ☐ Poor

Next follow-up: _____

Planning:

☐ **Keep patient informed of progress & diet related lab values**

☐ Review weight status

☐ Reinforce & modify diet as needed

☐ Others: _____

Dietitian : _____

Ext/pager number : _____

APPENDIX 17 : SAMPLE DIET PLAN & MENU

Diet Plan for Pre-dialysis (1900 kcal)

(55 kg adult ; 1900 kcals, 0.8 g/kg protein, 1-3 g sodium, < 1 g/day phosphorus, 2-3 g potassium, 500-1000 mls fluids)

Foods	Exchanges	CHO (g)	Protein (g)	Fat (g)	Kcal
Cereals	9	135	18	4.5	675
Fruits	2	30			120
Chicken	2		14	8	130
Fish	2		14	2	70
Oil	11			55	495
Sugar	7 tbsp	105			420
Total		270	46	69.5	1910
		x 4	x 4	x 9	
		1080 (57 %)	184 (10 %)	625.5 (33 %)	

Foods	Exch.	BF	L	AT	D
Cereals	9	2	2	2	3
Fruits	2		1		1
Chicken	2				2
Fish	2		2		
Oil	11	2	5		4
Sugar	7 tbsp	3	1	2	1

Sample Menu for Pre-dialysis

Breakfast
White toast (2 slices)
+ Soft margarine (1 tbsp)
+ Jam (1 tbsp)
Tea/ coffee + Sugar (1 tbsp)

Lunch
Cooked rice (100 g)
Fried pomphret in sweet sour sauce (70 gm)
+ Vineger + fresh tomatoes (1)
Mixed vegetables (1/2 cup)
(cauliflower, carrot, capsicum)
Guava (1/2)

Afternoon Snack
Tea/ coffee + sugar (1 tbsp)
Kueh Sago (1)

Dinner
Buttered fried rice (100 gm)
Fried kangkung with chilli (1 serving)
Apple (1)
Rose syrup

Approximate Nutrient Analysis			
Energy (kcal)	1902.8	Thiamin (mg)	1.0
Protein (g)	46.2 (10 %)	Riboflavin (mg)	1.2
Carbohydrate (g)	290.7 (60 %)	Niacin (mg)	14.4
Fat (g)	63.6 (30 %)	Vitamin B-6 (mg)	1.1
Cholesterol (mg)	42.5	Vitamin B-12 (mg)	0.3
Sodium (mg)	1508.5	Vitamin A (RE)	1441.2
Potassium mg)	1263.5	Vitamin C (mg)	373.7
Phosphorus (mg)	522.7	Folate (ug)	179.7
Calcium (mg)	345.5	Zinc (mg)	3.4
Iron	12.0	Dietary Fiber	22.0
Magnesium (mg)	133.3	Crude fiber	2.6

Diet plan for Haemodialysis

(55 kg adult ; 1900 kcals, 1.2 g/kg protein, 2-3 g sodium, < 1g/day phosphorus, 2-3 g potassium, 500-750 mls fluids)

Foods	Exchanges	CHO (g)	Protein (g)	Fat (g)	Kcal
Cereals	11	165	22	5.5	825
Fruits	2	30			120
Chicken	3		21	12	195
Fish	3		21	6	105
Oil	8			40	360
Sugar	5 tbsp	75			300
Total		270	64	63.5	1905
		x 4	x 4	x 9	
		1080 (57 %)	256 (13 %)	571.5 (30 %)	

Foods	Exch.	BF	MT	L	AT	D
Cereals	11	2	1	3	2	3
Fruits	2			1		1
Chicken	3					3
Fish	3			3		
Oil	8	1		4	1	2
Sugar	5	1	1		2	1

Sample Menu for Hemodialysis

Breakfast
Plain Dosai (1 piece)
Yellow dhall gravy (1/2 cup)
Tea/ coffee + sugar (1tbsp)

Morning tea
Kueh apam gula hangus (1)
Tea/ coffee + sugar (1 tbsp)

Lunch
Cooked rice (150 gm)
Fried ikan kembong coated with corn flour (80 gm)
Cabbage stir-fried (1/2 cup)
Watermelon (1 slice)

Afternoon Snack
Tea (200 mls) +sugar (1 tbsp)
Fried Popia (2)

Dinner
Fried mee Chinese style
+ chicken pieces (80 gm)
+ mustard leaves (cut & soaked)
Barley water + sugar (1 tbsp)
Lai (1)

Approximate Nutrient Analysis			
Energy (kcal)	1943.5	Thiamin (mg)	0.7
Protein (g)	68.4 (14 %)	Riboflavin (mg)	1.3
Carbohydrate (g)	285.3 (59 %)	Niacin (mg)	11.4
Fat (g)	58.8 (27 %)	Vitamin B-6 (mg)	1.5
Cholesterol (mg)	186.2	Vitamin B-12 (mg)	5.8
Sodium (mg)	2298.3	Vitamin A (RE)	709.0
Potassium (mg)	1876.8	Vitamin C (mg)	140.9
Phosphorus (mg)	1098.5	Folate (ug)	79.4
Calcium (mg)	304.4	Zinc (mg)	5.6
Iron	12.0	Dietary Fiber	8.0
Magnesium (mg)	202.5	Crude fiber	0.4

Diet plan for for CAPD
(55 kg adult; 1500 kcals, 1.5 g/kg protein, 2-4 g sodium, 1g/day phosphorus, 3-4 g potassium, 2000 mls fluids)

	Exchanges	CHO (g)	Protein (g)	Fat (g)	Kcal
Cereals	8	120	16	4	600
Fruits	2	30			120
Chicken/egg	5		35	20	325
Fish	3		21	6	105
Oil	5			25	225
Sugar	2	30			120
Total		180	72	55	1495
		x 4	x 4	x 9	
		720 (48 %)	288 (19 %)	495 (33 %)	

Foods	Exch.	BF	L	AT	D
Cereals	8	2	2	2	2
Fruits	2		1		1
Chicken/ egg	5	2	3		
Fish	3				3
Oil	5	2	1		2
Sugar		1		1	

Sample Menu for CAPD

Breakfast
Fried meehoon
+ Fried egg (1)
Tea/ coffee
Sugar (1 tbsp)

Lunch
Cooked rice (100 gm)
Roasted Pandan Chicken
Old cucumber soup
Apple

Afternoon Snack
Tea/ coffee
+ Sugar (1 tbsp)
Kueh lapis (1)

Dinner
Cooked rice (100 gm)
Fish, fried in chilli
Fried petola + Fuchok + Su-un
Papaya (1 slice)

Approximate Nutrient Analysis			
Energy (kcal)	1506.4	Thiamin (mg)	0.5
Protein (g)	70.1 (19 %)	Riboflavin (mg)	1.1
Carbohydrate (g)	205.9 (54 %)	Niacin (mg)	13.1
Fat (g)	45.1 (27 %)	Vitamin B-6 (mg)	1.0
Cholesterol (mg)	316.8	Vitamin B-12 (mg)	1.0
Sodium (mg)	1632.7	Vitamin A (RE)	910.5
Potassium mg)	1513.0	Vitamin C (mg)	181.9
Phosphorus (mg)	1086.3	Folate (ug)	111.7
Calcium (mg)	217.4	Zinc (mg)	5.0
Iron	10.4	Dietary Fiber	7.1
Magnesium (mg)	139.3	Crude fiber	1.6

Diet Plan for Vegetarian on CAPD

Foods	Exch.	BF	L	AT	D
Cereals	9	3	3	1	2
Fruits	2		1		1
Veg.protein	7½	1	3½		3
Oil	4		2		2

Sample meal distribution for CAPD (1500 kcal)

	Exchanges	CHO (g)	Protein (g)	Fat (g)	Kcal
Cereals	9	135	18	4.5	675
Fruits	2	30			120
Veg. protein	71/2		52.5	30	488
Oil	4			20	180
Total		165	70.5	54.5	1463
		x 4	x 4	x 9	
		660 (46 %)	282 (20 %)	490.5 (34 %)	

Sample Menu for CAPD (Vegetarian)

(55 kg adult; 1500 kcal, 1.3 g/kg protein, 2-4 g sodium, 1g/day phosphorus, 3-4 g potassium, 1500 ml fluids)

Breakfast
Soup Tang-hoon (50 g)
+Tau-hoo (100 g)
+Taugeh/carrot
Tea/ coffee + sugar (1 tbsp)

Lunch
Cooked rice (150 g)
Stir fried kacang panjang (½ cup)
Tempeh goreng (150 g)
Green pear (1 exch.)

Afternoon Snack
Kuih Kastard Jagung (1 piece)
Tea/coffee + sugar (1 tbsp)

Dinner
Vegetarian fried rice (100 g)
+ Taukua (200 g)
+ Mixed vegetables
Star fruit (1 exch.)

Approximate Nutrient Analysis			
Energy (kcal)	1545	Thiamin (mg)	1.0
Protein (g)	69.2	Riboflavin (mg)	1.6
Carbohydrate (g)	210.2	Niacin (mg)	12.2
Fat (g)	48.6	Vitamin B-6 (mg)	0.75
Cholesterol (mg)	7.2	Vitamin B-12 (mg)	0.14
Sodium (mg)	769.1	Vitamin A (RE)	1114.6
Potassium mg)	1286.2	Vitamin C (mg)	93.2
Phosphorus (mg)	900.8	Folate (ug)	179.3
Calcium (mg)	740.3	Zinc (mg)	6.9
Iron	15.6	Dietary Fiber	18.2
Magnesium (mg)	301.0	Crude fiber	2.1

Note:
* Estimated 300-400kcal of calories is from the dialysate.

APPENDIX 18 : TIPS FOR REDUCING SODIUM WHEN EATING OUT

The following tips are to help individuals who eat out or eat commercial ready-to-eat food items to limit sodium in their diet.

1. Limit the choice of foods that are obviously salty such as keropok, salty biscuits, nuts, potato chips, french fries, salted fish/ egg/ vegetables and pickles.
2. At food stalls/ restaurants request dishes to be prepared without added salt/ monosodium glutamate (MSG) when possible. Ask about the methods of preparation and request for low sodium changes you would like in the preparation.
3. Avoid belacan, budu, tempoyak and cincalok. These items are added as flavour enhancers for stir-fried vegetables, sambals and noodle dishes.
4. Seasoned foods with natural herb and spices such as pepper, chilli, lemon grass leaves, pandan leaves, coriander or curry leaves instead of salt are advisable choices.
5. Avoid processed and cured foods that are very high in sodium such as cheese, bacon, sausage, ham, hot dogs, pepperoni. Also limit smoked, cured, or processed beef, pork, or poultry.
6. For Western menus, omit salad dressing, condiments, sauces and gravies. Alternately request their serving on the side so as to limit their use. Consider lime/ lemon juice or vinegar as salad dressing.
7. Choose fresh meat, fish or poultry prepared without sauces or gravies. Limit salty based sauces such as soy, teriyaki, barbecue, oyster, chilli, tomato and steak sauces.
8. Limit or avoid broth, cream soup or soups prepared with stock cubes.
9. If a food tastes salty to you, just put it aside.

Remember:

Try not to eat out too often. Even though these tips will help you make better choices outside, home preparation of foods is the best way to control sodium content of food intake.