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Diabetes and Chronic Kidney Disease Basics: Part One

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Intended Audience: CKD Diabetes Patients, Renal Dietitians

AN ESTIMATED 14.8% of adults have chronic kidney disease (CKD).[1] Diabetic kidney disease (DKD) is classified according to the presence of microalbuminuria or macroalbuminuria.[2] Of the 30 million United States (US) individuals with diabetes, those who met any criteria for DKD is estimated at 26.2%. Using 2010 census data, this translates to a prevalence of approximately 8.2 million people with any DKD, including 4.6 million people with albuminuria, 1.9 million people with macroalbuminuria, 4.5 million people with reduced estimated glomerular filtration rate (eGFR), and 0.9 million people with severely reduced eGFR.[3]

DKD typically develops after a diabetes duration of 10 years in type 1 diabetes but may be present at diagnosis in type 2 diabetes. DKD can progress to end-stage renal disease requiring dialysis or kidney transplantation and is the leading cause of renal failure in the US. In addition, among patients with type 1 or type 2 diabetes, the presence of CKD markedly increases cardiovascular risk.[4]

The primary nutrition recommendations for diabetes include an individualized meal pattern, but to maintain stable blood glucose levels, it is important to focus on the amount of carbohydrate at meals. Carbohydrate intake from vegetables, fruits, legumes, whole grains, and dairy products, with an emphasis on foods higher in fiber, is preferred over other sources, especially those containing added sugars. For individuals with type 1 diabetes and those with type 2 diabetes who are prescribed a flexible insulin therapy program, education on carbohydrate counting and, in some cases, fat and protein gram estimation to determine mealtime insulin dosing is recommended to improve glycemic control. For diabetics whose daily insulin dosing is fixed, a consistent pattern of carbohydrate intake with respect to time and portions may be recommended to improve glycemic control and reduce the risk of hypoglycemia.[4]

Appropriate nutrition interventions may have an effect on clinical outcomes in the DKD population.[5] The optimal meal plan for DKD varies depending on eGFR or stage of kidney disease and the presence of additional comorbidities such as hypertension or heart failure. Although meal planning for diabetes requires changes to an individual's daily life, the addition of adjustments for CKD adds an extra level of complexity and confusion. Teaching the person with DKD requires extensive ongoing education regarding the effect of carbohydrate on blood glucose levels along with dietary adjustments of protein, potassium, phosphorus, and sodium. It is beyond the scope of this article to compile an extensive handout for DKD, but rather to focus on carbohydrate-containing foods with key nutrients that should be limited with DKD.

This is the first of a 2-part series covering basic information for individuals with DKD. This first handout is not meant to replace the registered dietitian nutritionist who specializes in renal nutrition but rather provides a starting point to be used by the nonspecialist with the individual with DKD to focus on phosphorus, potassium, and carbohydrate sources. Given that protein and sodium content is readily available on nutrition facts labels, this handout will cover items that are not as easily identified by individuals and health care professionals. The second part of this series provides an overview of DKD nutrition recommendations, along with a 7-day sample menu to be used with individuals.

References

1. United States Renal Data System. USRDS Annual Data Report. Introduction to Volume 1: CKD in the United States. *Am J Kidney Dis.* 2017;69(Suppl 1):S1-S32.

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5. Tuttle KR, Bakris GL, Bilous RW, et al. Diabetes kidney disease: a report from an ADA consensus conference. *Diabetes Care.* 2014;37:2864-2883.

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References for Nutrition Information in Handout:

A: National Kidney Foundation. Potassium and your CKD Diet. https://www.kidney.org/atoz/content/potassium.
B: National Kidney Foundation. Phosphorus and your CKD Diet. https://www.kidney.org/atoz/content/phosphorus.
C: Academy of Nutrition and Dietetics Nutrition Care Manual. https://www.nutritioncaremanual.org/.

DKD: Focus on Phosphorus, Potassium and Carbohydrate Sources

Carbohydrate is the main source of fuel that raises blood sugars. Carbohydrates are needed for our bodies to work properly. It is important to:

1) Eat the same amount of carbohydrate at meals and snacks to keep blood sugars even throughout the day.
2) Do not skip meals, especially if you are taking diabetes medications or insulin.
3) Eat meals and snacks at about the same time every day.

What foods contain carbohydrates? And how many carbohydrates are in foods?	
	Each serving contains 15 g of carbohydrate:
• Grains, beans, starchy vegetables	
○ Bread and biscuits/buns	1 slice bread, 1 oz biscuit/bun
○ Cereals	¾ cup dry cereal
○ Corn	½ cup cooked corn
○ Crackers and chips	6 saltine crackers, 10 chips
○ Dried beans (kidney beans, lima beans), peas and lentils	⅓ cup baked beans, ½ c peas
○ Muffins	½ English muffin, 1 oz blueberry
○ Pancakes and waffles	4" pancake or waffle
○ Potatoes and French fries	½ cup
○ Rice and noodles/pasta	⅓ cup cooked
○ Rolls	1 small dinner roll
○ Soups	1 cup broth-based; ½ c cream-based
○ Tortillas	6" tortilla
○ Yams, sweet potatoes	½ cup
• Fruits and juices	
○ Canned, frozen and fresh	1 cup fresh fruit, ½ cup canned fruit/juice
• Milk and yogurt	1 cup milk or yogurt
• Sweets and desserts	
○ Candy	6 pieces of hard candy
○ Cake and pie	1 small piece of cake or ⅛ of pie
○ Cookies	2 shortbread; 1 3" sugar cookie
○ Donuts	3" plain
○ Honey	1 Tbsp
○ Ice cream	½ cup
○ Puddings and gelatin	¼ cup puddings, ½ cup
○ Soft drinks	½ cup
○ Sugar	1 Tbsp
○ Syrup	1 Tbsp

How many carbohydrates are needed at each meal?
The amount needed for each person should be individualized, but a good starting point is: **Breakfast:** 45-60 grams carbohydrates **Lunch:** 60-75 grams carbohydrates **Dinner:** 60-75 grams carbohydrates **Snacks:** 0-15 grams carbohydrates

If you've been told to follow a low potassium or low phosphorus diet, avoid eating too many of these foods:

- High potassium fruits and vegetables
- Frozen, convenience, prepackaged foods and snacks
- Bottled beverages that have phosphorus and/or potassium additives and preservatives
- Discuss with a registered dietitian nutritionist your daily goals for dairy products, nuts, legumes and whole grains.
- Foods enriched with extra vitamins and minerals, especially some dry cereals and beverages

Quick Tips:

- Choose more low to moderate potassium and phosphorus carbohydrate choices at meals.
- Decrease food portion sizes to lower the amount of carbohydrate, potassium and phosphorus you are eating.
- Read food labels and review ingredient lists as products vary in nutritional content.

All servings equal 15 grams of carbohydrate.

Low Potassium and Phosphorus **≤ 50 mg of each per serving**	
1 oz bagel	1 oz homemade cornbread
1 slice white bread	½ English muffin
½ hamburger or hot dog bun	½ of 6" pita
¾ cup of rice or corn cereal	½ cup cream of wheat or grits
⅓ cup white or brown rice	⅓ cup pasta, cooked
3 graham cracker squares	¾ oz unsalted pretzels
3 cup unsalted air-popped popcorn	1 tortilla, flour or corn-6"
9 (¾ oz) unsalted tortilla chips	

Moderate Potassium **50-200 mg per serving**	**Moderate Phosphorus** **50-100 mg per serving**
1 small apple ½ cup apple, cranberry, grape, lemon, lime or pineapple juice ½ cup applesauce, unsweetened ½ cup cherries ½ cup fresh cranberries ½ cup fruit cocktail 1 cup mixed vegetables ½ cup oatmeal ½ cup canned peaches or pears ¾ cup fresh pineapple ½ cup vanilla pudding 1 cup raspberries 1 tangerine 4" pancake or waffle ½ cup corn or green peas	⅓ cup baked beans ¾ cup unsweetened dry cereal ¼ cup granola ½ cup ice cream or frozen yogurt 1 small biscuit or muffin ¼ cup oatmeal ⅓ cup egg noodles or whole wheat pasta 4" pancake or waffle

High Potassium **> 200 mg per serving**	**High Phosphorus** **> 100 mg per serving**
4 apricots ½ banana ½ cup cooked beans ⅓ cup baked beans 1 small bran muffin or ½ cup bran cereal 1 cup cantaloupe or honeydew cubes ½ cup mango or papaya 10-13 French fries 1 large kiwi ½ cup chocolate milk 1 cup soy, skim, 1%, 2%, whole milk 1 small nectarine or peach 1 orange ½ cup orange juice, prune juice 12-18 potato chips ½ cup mashed potato or ½ small potato ½ cup sweet potato ½ cup chocolate pudding=30g carbohydrates ¾ cup plain or fruited yogurt 1 ounce raisins 1 ¼ cup strawberries or watermelon cubes	½ cup bran cereal ½ cup cooked beans ½ cup peas ¼ cup of granola 1 cup skim, 1%, 2%, whole milk ½ cup oatmeal ½ small potato with skin ½ cup pudding = 30g carbohydrates 1 cup soy milk 1 corn/flour tortilla- 6 inch 1 waffle or pancake- 4 inch ½ cup fruit yogurt ¾ cup plain yogurt