

# Chronic Kidney Disease and Nutrition<sup>1</sup>

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## Overview of Chronic Kidney Disease

Chronic kidney disease (CKD) is considered a public health issue within the United States because an estimated 37 million adults or 15% of the population have this disease (CDC 2020). CKD is a disease characterized by the gradual loss of kidney function. Early prevention techniques such as a well-balanced diet reduce the progression of this disease (National Kidney Foundation, n.d.; Rysz et al. 2017). The purpose of this article is to provide an overview of CKD and nutritional considerations.

## Risk Factors for CKD

As stated by the National Kidney Foundation (2019), some of the common risk factors for CKD are:

- Age: People over 60 years of age have a higher risk due to the natural aging process.
- Family history: Genetics may increase an individual's risk for CKD.
- High blood pressure: Elevated blood pressure may damage the kidney's small blood vessels, leading to loss of organ function.
- Diabetes: Elevated blood sugar may have a detrimental effect on the kidneys' blood vessels.

## Reducing Your Risk for CKD

The National Institutes of Diabetes and Digestive and Kidney Diseases (2019) have the following recommendations to keep the kidneys healthy:

- Stop smoking: Smoking increases blood pressure and reduces the blood flow to the kidneys.
- Explore techniques for stress reduction and management: Stress may contribute to elevation in blood pressure and inflammation.
- Stay active: Get in at least 30 minutes of physical activity daily. Exercise training improves blood pressure and blood sugar levels.
- Consume a nutritious diet that includes fruits, vegetables, whole grains, beans, and legumes, and consume less of high-sodium/high-fat and added-sugar foods, such as sauces, chips, and cake, to reduce blood pressure and blood sugar.
- Alcohol intake: Limit drinking to no more than one serving of alcoholic beverage per day for females and no more than two servings of alcoholic beverages for males.
  - Beverage amounts equal to one serving:
    - 12 ounces of 5% ABV beer
    - 8 ounces of 7% ABV malt liquor
    - 5 ounces of 12% ABV wine
    - 1.5 ounces of 40% ABV (80 proof) distilled spirits or liquor (USDA 2015)

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## A Closer Look at Nutrients

Based on the National Kidney Foundation Kidney Disease Outcomes Quality Initiative (KDOQI) (2020), if you are diagnosed with CKD, there are some key nutrients you will need to monitor (see Table 1). Talk with a registered dietitian nutritionist for further information.

In summary, the risk factors for CKD include age, genetics, diabetes, and high blood pressure. Even though you cannot change the aging process or genetics, controlling your blood glucose and blood pressure through diet will help reduce your risk for CKD. If you are diagnosed with CKD, certain nutrients will need to be monitored. If you are diagnosed with earlier stages of CKD (1–3), below are some kidney-friendly recipe options for breakfast, lunch/dinner, and snacks that focus on these nutrients. Even though these recipes are specifically for those with earlier stages of CKD, be sure to discuss the appropriateness of incorporating these meals into your diet and your specific nutrient recommendations with a registered dietitian nutritionist.

## References

Bruce, M. A., D. M. Griffith, and R. J. Thorpe. 2015. “Stress and the Kidney.” *Advances in Chronic Kidney Disease* 22 (1): 46–53. <https://doi.org/10.1053/j.ackd.2014.06.008>

Centers for Disease Control and Prevention (CDC). 2020. “Chronic Kidney Disease (CKD) Surveillance System.” Retrieved on June 12, 2020 from <https://nccd.cdc.gov/ckd>

ESHA Food Processor and Nutrition Analysis. 2020. ESHA v 11.1. Retrieved from <https://esha.com/products/food-processor/>

Ikizler, T. A., J. D. Burrowes, L. D. Byham-Gray, K. L. Campbell, J.-J. Carrero, W. Chan, D. Fouque, et al. 2020. “KDOQI Clinical Practice Guideline for Nutrition in CKD: 2020 Update.” *Am J Kid Disease* 76 (3 S1): S1–S107. <https://doi.org/10.1053/j.ajkd.2020.05.006>

National Institute of Diabetes and Digestive and Kidney Diseases. 2019. “Preventing Chronic Kidney Disease.” Retrieved on June 12, 2020 from <https://www.niddk.nih.gov/health-information/kidney-disease/chronic-kidney-disease-ckd/prevention>

National Kidney Disease. n.d. “Prevention.” Retrieved on June 14, 2020 from <https://www.kidney.org/prevention>

Rysz, Jacek, Beata Franczyk, Aleksandra Cialkowska-Rysz, and Anna Gluba-Brzózka. 2017. “The Effect of Diet on the Survival of Patients with Chronic Kidney Disease.” *Nutrients* 9 (5): 495. <https://doi.org/10.3390/nu9050495>

Stump, C. S. 2011. “Physical Activity in the Prevention of Chronic Kidney Disease.” *Cardiorenal Medicine* 1 (3): 164–173. <https://doi.org/10.1159/000329929>

# Breakfast Ideas

## Oatmeal with Fruit and Almonds

(1 serving)

### Ingredients

- ½ cup quick oats
- 1 cup water
- ¼ tsp cinnamon
- ¼ cup 0% fat plain Greek yogurt (to bulk)
- ½ cup frozen mixed berries or ½ cup diced medium apples (depending on the season)
- 1 tsp sliced almonds

### Preparation

1. Add the oats, water, and cinnamon to a small pot.
2. Prepare oats according to package directions. The oatmeal is done when all the liquid is absorbed and the oats are thick and fluffy.
3. Remove the pot from the heat and stir in the Greek yogurt.
4. Serve in a bowl and top with fruit and almonds.

### Nutrition Facts per Serving

<b>Protein</b>	14 g
<b>Fiber</b>	7 g with mixed berries
	5 g with apple
<b>Phosphorus</b>	233 mg with mixed berries
	236 mg with apple
<b>Potassium</b>	236 mg
<b>Sodium</b>	20 mg
<b>Calcium</b>	122 mg
<b>Vitamin D</b>	40 IU

## Egg Omelet

(1 serving)

### Ingredients

- ½ cup diced mushrooms (fresh or frozen)
- ¼ cup diced red bell pepper (fresh or frozen)
- 2 tbsps diced yellow onion
- 1 medium-sized egg
- cooking spray
- pinch of black pepper

### Preparation

1. Apply cooking spray to the pan and sauté the mushrooms, red bell peppers, and onions for 5 minutes or until they are soft. Place on a plate.
2. Beat the egg and place in the sprayed pan. Season the egg with black pepper and cook over medium heat.
3. When the top surface of the egg has thickened, add the cooked vegetables. Fold in the vegetables and continue cooking until the omelet is set.

### Nutrition Facts per Serving

<b>Protein</b>	7 g
<b>Fiber</b>	2 g
<b>Phosphorus</b>	133 mg
<b>Potassium</b>	257 mg
<b>Sodium</b>	70 mg
<b>Calcium</b>	37 mg
<b>Vitamin D</b>	40 IU

## Peach Pancakes

(2 servings)

### Ingredients

- 2 medium-sized eggs
- 1 medium peach, chopped
- ½ cup quick oats
- ½ tsp cinnamon
- cooking spray

### Preparation

1. Using a blender, blend oats until they resemble flour.
2. In the same blender, add the remaining ingredients and blend it thoroughly.
3. Heat up a pan and spray it with cooking spray. Pour half of the mixture into the pan and cook for 3 minutes or until bubbles are visible on the top. Turn the pancake over and cook it for 3 more minutes. Repeat this step once more for a total of 2 pancakes.

### Nutrition Facts per Serving

<b>Protein</b>	9 g
<b>Fiber</b>	3 g
<b>Phosphorus</b>	177 mg
<b>Potassium</b>	278 mg
<b>Sodium</b>	65 mg
<b>Calcium</b>	43 mg
<b>Vitamin D</b>	40 IU

For further information about CKD and kidney-friendly recipes, visit:

National Kidney Foundation at <https://www.kidney.org/nutrition>

National Institute of Diabetes and Digestive and Kidney Diseases at <https://www.niddk.nih.gov/health-information/kidney-disease/chronic-kidney-disease-ckd/eating-nutrition>

## Lunch/Dinner Ideas

### Penne Pasta with Chicken and Asparagus

(4 servings)

#### Ingredients

- 2 tbsp olive oil
- 6 minced garlic cloves
- 8 oz skinless, boneless chicken breast cut in cubes.
- 1 lb frozen asparagus cut in 2" pieces
- 2 tsp lemon juice
- ½ tsp black pepper
- 8 oz whole-wheat penne pasta, uncooked
- ¼ cup shredded low-sodium parmesan cheese

#### Preparation

1. Cook pasta according to package instructions, omitting salt.
2. In a medium-sized skillet, heat the olive oil over medium heat and sauté garlic for 2–3 minutes. Add the cubed chicken pieces to the pan and let cook for 8 minutes.
3. Add asparagus, lemon juice, and black pepper to the skillet and cook for 6 min until crisp.
4. Drain pasta and transfer to a bowl. Toss pasta with the asparagus and chicken mixture. Sprinkle the parmesan cheese on top.

#### Nutrition Facts per Serving

<b>Protein</b>	25 g
<b>Fiber</b>	2 g
<b>Phosphorus</b>	93 mg
<b>Potassium</b>	282 mg
<b>Sodium</b>	45 mg
<b>Calcium</b>	83 mg
<b>Vitamin D</b>	0 IU

### Hearty Vegetable Soup

(6 servings)

#### Ingredients

- 32 oz sodium-free vegetable broth
- 16 oz can low-sodium kidney beans
- 1 medium yellow onion (diced)
- 2 medium carrots (sliced)
- 3 celery stalks (diced)
- 2 cups frozen chopped green beans
- 1 cup uncooked brown rice

#### Preparation

1. Dice the onion and celery, and slice the carrots.
2. In a two-quart saucepan, mix all the ingredient and simmer at medium heat for 18 minutes or until the rice is cooked and the carrots are soft. Serve and enjoy.

#### Nutrition Facts per Serving

<b>Protein</b>	8 g
<b>Fiber</b>	10 g
<b>Phosphorus</b>	197 mg
<b>Potassium</b>	441 mg
<b>Sodium</b>	210 mg
<b>Calcium</b>	79 mg
<b>Vitamin D</b>	0 IU

### Salmon with Cabbage and Quinoa

(4 servings)

#### Ingredients

- 1 lb head of green cabbage, cut into 1" thick slices
- 16 oz salmon, skin on (2 fillets)
- 2 tbsp olive oil
- 6 smashed garlic cloves
- ⅔ cup quinoa (uncooked)
- ½ tsp ground black pepper

#### Preparation

1. Prepare quinoa according to package instructions, omitting the salt. Preheat the oven to 400°F.
2. In a bowl, mix the garlic, black pepper, and olive oil, and fully coat the cabbage. Roast the coated cabbage for 30 minutes on the middle rack of the oven. After this time, carefully flip the cabbage.
3. Season salmon fillet with pepper and roast it on top of the cabbage for an additional 30 minutes.
4. After this time, the cabbage edges should be brown and crispy and salmon fully cooked. Serve with a portion of quinoa.

#### Nutrition Facts per Serving

<b>Protein</b>	11 g
<b>Fiber</b>	2 g
<b>Phosphorus</b>	122 mg
<b>Potassium</b>	577 mg
<b>Sodium</b>	340 mg
<b>Calcium</b>	78 mg
<b>Vitamin D</b>	0 IU

## Snack Ideas

### Berry Oat Shake

(1 serving)

#### Ingredients

- ½ cup cooked and chilled oatmeal
- ⅔ cup rice milk
- 1 tbsp brown sugar
- 1½ tsp vanilla extract
- ½ cup frozen mixed berries

#### Preparation

1. In a blender, add the oatmeal, milk, brown sugar, vanilla, and berries to the preparation and blend until the desired consistency. Enjoy!

#### Nutrition Facts per Serving

<b>Protein</b>	4 g
<b>Fiber</b>	3 g
<b>Phosphorus</b>	182 mg
<b>Potassium</b>	152 mg
<b>Sodium</b>	70 mg
<b>Calcium</b>	224 mg
<b>Vitamin D</b>	80 IU

### Apple Slices with Honey and Cinnamon

(1 serving)

#### Ingredients

- 1 medium gala apple
- 1 tbsp honey
- cinnamon powder to taste

#### Preparation

1. Cut apple into slices and place the slices on a plate.
2. Drizzle honey over the slices and top them with cinnamon.

#### Nutrition Facts per Serving

<b>Protein</b>	0 g
<b>Fiber</b>	1 g
<b>Phosphorus:</b>	18 mg
<b>Potassium:</b>	180 mg
<b>Sodium:</b>	0 mg
<b>Calcium:</b>	14 mg
<b>Vitamin D:</b>	0 IU

### Hummus

(3 servings)

#### Ingredients

- 1 (15 oz can) low-sodium chickpeas
- 1 fresh lemon (juice)
- ¼ cup tahini
- 1 tbsp chopped garlic
- 2 tbsp olive oil
- ½ tsp ground cumin
- 3 tbsp water or as needed
- 1 tbsp olive oil to decorate

#### Preparation

1. Drain the chickpeas and reserve.
2. In a food processor, blend the lemon juice and tahini for 1 minute, scraping down the sides of your blender after 30 seconds. Add the olive oil, garlic, and cumin. Blend it for another 1 minute, scraping after 30 seconds.
3. Add half of the chickpeas and blend for 1 minute, scraping after 30 seconds. Add the remaining chickpeas and blend for an additional 1 minute, scraping after 30 seconds.
4. Add water to your hummus, to obtain the desired consistency.
5. Transfer the hummus to a serving bowl. Drizzle the remaining olive oil on top.

#### Nutrition Facts per Serving

<b>Protein</b>	5 g
<b>Fiber</b>	7 g
<b>Phosphorus</b>	138 mg
<b>Potassium</b>	159 mg
<b>Sodium</b>	100 mg
<b>Calcium</b>	43 mg
<b>Vitamin D</b>	0 IU

Table 1. Key Nutrients

Nutrient	General recommendations	Main body functions	Examples of foods that contain these nutrients
Protein	<p><b>Stages 1–2:</b> Adhere to the Recommended Dietary Allowance.</p> <p><b>Stages 3–5:</b> Decreased</p> <p><b>Dialysis:</b> Increased</p>	<p>Builds and repairs muscle tissue. In stages 3–5 of kidney disease, it becomes more difficult for your body to filter out protein waste. Proteins then accumulate in the blood and the disease progresses.</p> <p>During dialysis, a machine helps you filter the waste that has built up in your blood. During this process, some proteins will be lost, and thus more protein is needed to help the recovery process.</p>	<p>Beans, legumes, soy, and animal-based foods such as chicken, pork, fish, red meat, dairy, and eggs.</p>
Fiber	<p>Adhere to the Recommended Dietary Allowance.</p>	<p>Maintains digestive health. During kidney disease, consuming fiber may improve gut function and reduce inflammation.</p>	<p>Apricots, beets, figs, berries, eggplant, and summer squash.</p>
Calcium	<p>Decreased</p>	<p>Maintain bone and muscular strength. During kidney disease, there is an imbalance in bone metabolism, and thus more calcium may be stored in the blood vessels, which leads to heart disease.</p>	<p>Beans, figs, fortified orange juice, dark leafy greens, and dairy.</p>
Phosphorus	<p>Decreased</p>	<p>Aids in the formation of bones and teeth. During kidney disease, the body is unable to remove phosphorus well; excess phosphorus in the body may weaken the bones and lead to a buildup of phosphorus in the blood vessels, which contributes to heart disease.</p>	<p>Beans, legumes, and animal-based foods such as chicken, fish, and dairy.</p>
Potassium	<p>Decreased</p>	<p>Regulates heartbeat and muscle function. During kidney disease, excess potassium cannot be removed, which builds up in the body and leads to heart issues.</p>	<p>Fruits such as bananas, cantaloupe, and orange juice. Vegetables such as white and sweet potatoes, and tomato juice.</p>
Sodium	<p>Less than 2300 mg</p>	<p>Regulates nerve and muscle function. During kidney disease, excess sodium is not removed, which builds up in the body and increases your blood pressure.</p>	<p>Naturally found in animal-based foods, fruits, vegetables, and whole grains. Added to foods such as chips, crackers, sauces, desserts, dressings as well as a variety of processed foods to enhance flavor and texture and to preserve freshness.</p>
Vitamin D	<p>Increased</p>	<p>Forms and maintains bone strength and enhances the immune system. During kidney disease, your kidneys are not able to activate the vitamin D that you obtained through the sun or food sources. Low levels of vitamin D causes higher levels of parathyroid hormone to be excreted; this contributes to calcium being pulled from the bones into the blood and leads to weakened bones.</p>	<p>Eggs, fish such as salmon, fortified orange juice, and mushrooms.</p>