# Proteinuria

*National Kidney and Urologic Diseases Information Clearinghouse*

U.S. Department of Health and Human Services

NATIONAL INSTITUTES OF HEALTH

NIDDK
NATIONAL INSTITUTE OF DIABETES AND DIGESTIVE AND KIDNEY DISEASES

## What is proteinuria?

Proteinuria—also called albuminuria or urine albumin—is a condition in which urine contains an abnormal amount of protein. Albumin is the main protein in the blood. Proteins are the building blocks for all body parts, including muscles, bones, hair, and nails. Proteins in the blood also perform a number of important functions. They protect the body from infection, help blood clot, and keep the right amount of fluid circulating throughout the body.

As blood passes through healthy kidneys, they filter out the waste products and leave in the things the body needs, like albumin and other proteins. Most proteins are too big to pass through the kidneys' filters into the urine. However, proteins from the blood can leak into the urine when the filters of the kidney, called glomeruli, are damaged.

Proteinuria is a sign of chronic kidney disease (CKD), which can result from diabetes, high blood pressure, and diseases that cause inflammation in the kidneys. For this reason, testing for albumin in the urine is part of a routine medical assessment for everyone. Kidney disease is sometimes called renal disease. If CKD progresses, it can lead to end-stage renal disease (ESRD), when the kidneys fail completely. A person with ESRD must receive a kidney transplant or regular blood-cleansing treatments called dialysis.

## Who is at risk for proteinuria?

People with diabetes, hypertension, or certain family backgrounds are at risk for proteinuria. In the United States, diabetes is the leading cause of ESRD.[1] In both type 1 and type 2 diabetes, albumin in the urine is one of the first signs of deteriorating kidney function. As kidney function declines, the amount of albumin in the urine increases.

Another risk factor for developing proteinuria is hypertension, or high blood pressure. Proteinuria in a person with high blood pressure is an indicator of declining kidney function. If the hypertension is not controlled, the person can progress to full kidney failure.

African Americans are more likely than Caucasians to have high blood pressure and to develop kidney problems from it, even when their blood pressure is only mildly elevated. In fact, African Americans are six times more likely than Caucasians to develop hypertension-related kidney failure.[2]

Other groups at risk for proteinuria are American Indians, Hispanics/Latinos, Pacific Islander Americans, older adults, and overweight people. These at-risk groups and people who have a family history of kidney disease should have their urine tested regularly.

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[1]United States Renal Data System. *USRDS 2007 Annual Data Report*. Bethesda, MD: National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health, U.S. Department of Health and Human Services; 2007.

[2]Ibid.

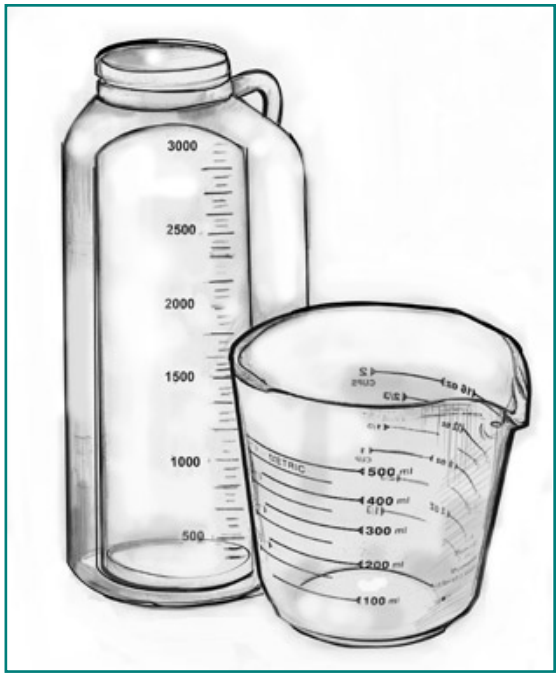
## What are the signs and symptoms of proteinuria?

Proteinuria has no signs or symptoms in the early stages. Large amounts of protein in the urine may cause it to look foamy in the toilet. Also, because protein has left the body, the blood can no longer soak up enough fluid, so swelling in the hands, feet, abdomen, or face may occur. This swelling is called edema. These are signs of large protein loss and indicate that kidney disease has progressed. Laboratory testing is the only way to find out whether protein is in a person's urine before extensive kidney damage occurs.

Several health organizations recommend regular urine checks for people at risk for CKD. A 1996 study sponsored by the National Institutes of Health determined that proteinuria is the best predictor of progressive kidney failure in people with type 2 diabetes. The American Diabetes Association recommends regular urine testing for proteinuria for people with type 1 or type 2 diabetes. The National Kidney Foundation recommends that routine checkups include testing for excess protein in the urine, especially for people in high-risk groups.

## What are the tests for proteinuria?

Until recently, an accurate protein measurement required a 24-hour urine collection. In a 24-hour collection, the patient urinates into a container, which is kept refrigerated between trips to the bathroom. The patient is instructed to begin collecting urine after the first trip to the bathroom in the morning. Every drop of urine for the rest of the day is to be collected in the container. The next morning, the patient adds the first urination after waking and the collection is complete.




Containers for a 24-hour urine collection.

In recent years, researchers have found that a single urine sample can provide the needed information. In the newer technique, the amount of albumin in the urine sample is compared with the amount of creatinine, a waste product of normal muscle breakdown. The measurement is called a urine albumin-to-creatinine ratio (UACR). A urine sample containing more than 30 milligrams of albumin for each gram of creatinine (30 mg/g) is a warning that there may be a problem. If the laboratory test exceeds 30 mg/g, another UACR test should be done 1 to 2 weeks later. If the second test also shows high levels of protein, the person has persistent proteinuria, a sign of declining kidney function, and should have additional tests to evaluate kidney function.

Cup for a single urine sample.

## What additional tests for kidney disease may be needed?

Tests that measure the amount of creatinine in the blood will show whether a person's kidneys are removing wastes efficiently. Having too much creatinine in the blood is a sign that a person has kidney damage. The doctor can use the creatinine measurement to estimate how efficiently the kidneys are filtering the blood. This calculation is called the estimated glomerular filtration rate, or eGFR. CKD is present when the eGFR is less than 60 milliliters per minute (mL/min).

## What should a person with proteinuria do?

If a person has diabetes, hypertension, or both, the first goal of treatment will be to control blood glucose, also called blood sugar, and blood pressure. People with diabetes should test their blood glucose often, follow a healthy eating plan, take prescribed medicines, and get the amount of exercise recommended by their doctor. A person with diabetes and high blood pressure may need a medicine from a class of drugs called angiotensin-converting enzyme (ACE) inhibitors or a similar class called angiotensin receptor blockers (ARBs). These drugs have been found to protect kidney function even more than other drugs that provide the same level of blood pressure control. Many patients with proteinuria but without hypertension may also benefit from ACE inhibitors or ARBs. The American Diabetes Association and the American College of Cardiology recommend that people with diabetes keep their blood pressure below 130/80.[3]

People who have high blood pressure and proteinuria, but not diabetes, also benefit from taking an ACE inhibitor or ARB. The Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure recommends that people with kidney disease keep their blood pressure below 130/80.[4] To maintain this target, a person may need to take a combination of two or more blood pressure medicines. A doctor may also prescribe a diuretic in addition to an ACE inhibitor or ARB. Diuretics

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[3]American Diabetes Association/American College of Cardiology. Hypertension in diabetes. *Diabetes & Cardiovascular Disease Review.* 2002; Issue 2.

[4]National High Blood Pressure Education Program. *The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure*. Bethesda, MD: National Heart, Lung, and Blood Institute, National Institutes of Health, U.S. Department of Health and Human Services; 2004.

are also called "water pills" because they help a person urinate and get rid of excess fluid in the body.

In addition to blood glucose and blood pressure control, the National Kidney Foundation recommends restricting dietary salt and protein. A doctor may refer a patient to a dietitian to help develop and follow a healthy eating plan.

## Points to Remember

- Proteinuria is a condition in which urine contains a detectable amount of protein.
- Proteinuria is a sign of chronic kidney disease (CKD).
- Groups at risk for proteinuria include African Americans, American Indians, Hispanics/Latinos, Pacific Islander Americans, older people, overweight people, people with diabetes or hypertension, and people who have a family history of kidney disease.
- Proteinuria may have no signs or symptoms. Laboratory testing is the only way to find out whether protein is in a person's urine.
- Several health organizations recommend regular checks for proteinuria so kidney disease can be detected and treated before it progresses.
- A person with diabetes, hypertension, or both should work to control blood glucose and blood pressure.

## Hope through Research

In recent years, researchers have learned much about kidney disease. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) sponsors several programs aimed at understanding kidney failure and finding treatments to stop its progression.

The NIDDK's Division of Kidney, Urologic, and Hematologic Diseases supports basic research into normal kidney function and the diseases that impair normal function at the cellular and molecular levels, including diabetes, high blood pressure, glomerulonephritis, and other diseases marked by proteinuria.

Participants in clinical trials can play a more active role in their own health care, gain access to new research treatments before they are widely available, and help others by contributing to medical research. For information about current studies, visit *www.ClinicalTrials.gov.*

## For More Information

**American Kidney Fund**
6110 Executive Boulevard, Suite 1010
Rockville, MD 20852
Phone: 1–800–638–8299 or 301–881–3052
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## National Kidney Disease Education Program

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The National Kidney Disease Education Program (NKDEP) is an initiative of the National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health, U.S. Department of Health and Human Services. The NKDEP aims to raise awareness of the seriousness of kidney disease, the importance of testing those at high risk, and the availability of treatment to prevent or slow kidney disease.

You may also find additional information about this topic by visiting MedlinePlus at *www.medlineplus.gov.*

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