

Urine Albumin Creatinine Ratio

Urine albumin and estimated glomerular filtration rate (eGFR) are the two key markers for chronic kidney disease (CKD). The National Kidney Disease Education Program (NKDEP) recommends annual assessment of urine albumin excretion to diagnose and monitor kidney damage in patients who have type 1 diabetes for five years or more, or who have type 2 diabetes. However, more frequent monitoring may be needed in patients with changing clinical status or after therapeutic interventions. (1)

Urine dipstick protein methods are not sensitive enough to detect microalbuminuria. (2) Lack of sensitivity means that a negative dipstick for albumin or protein does not rule out pathologic albuminuria or proteinuria. All forms of pathologic proteinuria are likely to begin with albuminuria, as albumin is, simultaneously, among the smallest and most prevalent proteins. A spot urine can be used, however, to compensate for variations in urine concentration, it is useful to compare the amount of albumin in the sample against its concentration of creatinine. This comparison is called the urine albumin to creatinine ratio (UACR).

UACR is a ratio between two measured substances. Both the urine albumin (mg/dl) and the urine creatinine (g/dl) are measured values. UACR estimates 24-hour urine albumin excretion. UACR is reported in mg/g and approximates the albumin excretion in mg/day. Unlike a dipstick test for albumin, UACR is unaffected by variations in urine concentration. The UACR is measured using the first morning urine sample when possible. Twenty-four-hour collection and timed specimens are not necessary.

Albuminuria is present when UACR is greater than 30 mg/g and is a marker for CKD (chronic kidney disease). Albuminuria is used to diagnose and monitor kidney disease. Changes in albuminuria may reflect positive or negative responses to therapy and risk for progression of kidney disease. A decrease in urine albumin may be associated with improved renal and cardiovascular outcomes.

For the diagnosis of microalbuminuria, care must be taken when collecting samples for the urine UACR. As most people now know, one of the earliest signs of diabetic nephropathy is so-called microalbuminuria. An early morning sample is preferred. The patient should refrain from heavy exercises 24 hours before the test. A repeat test should be done 3 to 6 months after the first positive test for microalbuminuria. The UACR is inaccurate in a person with too much or too little muscle mass due to the variation in creatinine level, which is produced by the muscle. The UACR is a useful measure of renal function in diabetic renal disease.

Microalbuminuria is defined as UACR ≥ 3.5 mg/mmol (female) or ≥ 2.5 mg/mmol (male), or, with both substances measured by mass, as a UACR between 30 and 300 μg albumin/mg creatinine. (2) An alternative definition of microalbuminuria is a UACR on a random urine sample of more than 30 mg (but less than 300 mg) of albumin per gram of creatinine. (2,3)

Proteinuria is defined as: UACR >30mg/mmol or albumin concentration >200mg/l.

Richard J Baltaro, MD PhD FCAP
Chemistry Resource Committee

References

- 1) National Kidney Disease Education Program,
http://nkdep.nih.gov/professionals/chronic_kidney_disease.htm (last accessed February 5, 2012)
- 2). American Diabetes Association: Nephropathy in diabetes. Diabetes Care 2004;27(Supplement 1):S79- S83.
- 3) Keane WE, Eknoyan G. Proteinuria, albuminuria, risk, assessment, detection, elimination (PARADE): a position paper of the National Kidney Foundation. Am J Kid Dis 1999; 33:1004-11.