Screening for Proteinuria in Patients with Hypertension or Diabetes Mellitus

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Background. Proteinuria is an early indication of renal disease. This study was conducted to evaluate the usefulness of dipstick urinalysis in patients with chronic diseases including hypertension and diabetes mellitus.

Methods. At a university family practice center, patients without urinary tract disorders underwent dipstick urinalysis.

Results. Of the 796 patients evaluated, increased proteinuria, possibly indicating early renal disease, was detected in 4% of healthy patients, 16% of patients with hypertension, 29% of patients with diabetes, and 53% of patients with both hypertension and diabetes. A higher incidence of proteinuria was found among African American patients with hypertension or diabetes or both than among white patients.

Conclusions. Regular dipstick evaluation for proteinuria may be indicated in patients with hypertension or diabetes mellitus or both, particularly African American patients with these disorders.

Key words. Urinalysis; proteinuria; hypertension; diabetes mellitus; blacks. (*J Fam Pract 1993; 37:253-256*)

High rates of renal insufficiency are found in patients with hypertension or diabetes mellitus or both, often despite therapeutic efforts. This is especially true for African Americans. Recent information shows that African Americans with hypertension develop end-stage renal disease (ESRD) at *six times* the rate of white Americans.[1 (pp 458–9)] In patients with diabetes mellitus, African Americans develop ESRD at *twice* the rate of white Americans.[1 (pp 397–8)] Since diabetes is now the leading cause of ESRD (30%), with hypertension the second leading cause of ESRD (26%), efforts to reduce the impact of these two conditions on renal disease should be a priority. The treatment of ESRD currently consumes 10% of the Medicare budget; this high percentage emphasizes the importance of preventing the development of ESRD.[2] The importance of hypertension as a cause of ESRD in African Americans has been reinforced by the results of several studies showing that controlling hypertension to acceptable levels in African Americans does not stop the progression or appearance of renal deterioration.[3–5]

Proteinuria, either from excess glomerular leakage or from decreased tubular resorption, is the most common sign of early renal disease.[6,7] Screening for proteinuria in patients at risk for ESRD may identify those patients in the early stages of renal decline.

Methods

A convenience sample of patients was recruited from The Ohio State University (OSU) Family Practice Center, which serves as the outpatient practice site for the faculty and residents of the OSU Department of Family Medicine. To qualify, patients had to be asymptomatic for genitourinary symptoms and not have a diagnosed urinary tract problem. Potential patients were approached at random by the study coordinator. If they were interested in participating and met the above criteria, they signed a consent form and provided a clean-catch urine specimen. All patients received a $5 coupon at a local fast-food restaurant for their participation.

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Percentage of White and African American Patients with Hypertension and Diabetes Who Had Proteinuria

Patient Condition	White Patients with Proteinuria, % (n)	African American Patients with Proteinuria, % (n)
Hypertension	8 (62)	25 (57)
Diabetes mellitus	18 (17)	41 (17)
Hypertension and diabetes mellitus	40 (5)	60 (10)

All urine samples were tested and evaluated by the same study coordinator using Ames Multistix 10 SG Reagent Strips and the Ames Clinitek 100 Urine Chemistry Analyzer (Miles Inc, Elkhart, Ind). The Clinitek automatically measures the color intensity of the pads on the strip, thus eliminating the subjectivity of the human eye in judging color intensity. A urine quality-control specimen (Ames Chek-Stix) was assayed repeatedly throughout the study to verify the analytical stability of the tests. Patients were considered to have proteinuria if testing showed a level of 30 mg/dL or greater. This level has been verified as being consistent with clinically significant proteinuria with the Ames dipstick.[8]

Results

Of 796 patients evaluated in the study, 231 were men, aged 13 to 83 years, and 565 were women, aged 15 to 80 years. There were 511 white, 262 African American, and 23 patients from other ethnic groups. Thirty-two percent of the patients were under 35 years of age, 60% were from 35 to 65 years of age, and 8% were over 65 years of age.

Proteinuria was found in only 66 of the 796 patients' urine samples analyzed by the Ames dipstick. The pattern of increased proteinuria was examined by reviewing the patients' charts for diagnoses and ethnicity. Of the 66 patients, 19 had hypertension, 10 had diabetes mellitus, 8 had hypertension and diabetes mellitus, 5 had coincident menses, 2 had urinary tract infections, and 1 had previously diagnosed exercise-induced proteinuria. Twenty-one patients had proteinuria with no known cause; all of these patients had a reading of 30 mg/dL.

The pattern of proteinuria in patients with diabetes mellitus, hypertension, and both is summarized in the Table. When the patients with known causes of proteinuria (including hypertension and diabetes mellitus) were eliminated, the incidence of proteinuria in our study group was low (21/581, or 4%). Of the 120 patients with hypertension who were evaluated, proteinuria was detected in 19 (16%). Proteinuria was detected in 10 of the 35 (29%) patients with diabetes mellitus and in 8 of the 15 (53%) patients with both hypertension and diabetes mellitus.

In patients with hypertension or diabetes mellitus, we found that there was a difference in the incidence of proteinuria between African American and white patients. Among white patients with hypertension, the incidence of proteinuria was 5 of 62 (8%) whereas among African American patients with hypertension, the incidence was 14 of 57 (25%) patients, a difference that was statistically significant ($P = .005$). In patients with diabetes mellitus, proteinuria was present in 3 of 17 (18%) white patients and in 7 of 17 (41%) African American patients, a trend that approached statistical significance ($P = .06$). Proteinuria was present in 4 of 6 African American patients and in 2 of 5 white patients with both hypertension and diabetes mellitus. The small numbers preclude statistical evaluation. A review of the patients' charts indicated that proteinuria was a *previously* undiagnosed complication in 17 of the 19 patients with hypertension, in 9 of the 10 patients with diabetes mellitus, and in 7 of the 8 patients with both disorders.

Discussion

Several authors have evaluated the usefulness of urinalysis performed on a screening basis. These studies included comprehensive evaluations of screening tests,[9,10] mass screenings of healthy adults,[11,12] pediatric patients,[13,14] and routine screening of hospitalized patients.[15–17] None of these studies concluded that the use of screening dipstick urinalysis in the patients studied could be justified.

Our project was not a comprehensive evaluation of the usefulness of dipstick urinalysis as a screening test for all patients. The value of our project comes from being able to identify those patients in whom screening by dipstick evaluation may elicit clinically significant new information. The important finding of this project was that higher rates of proteinuria occurred in certain groups of patients, ie, those with hypertension and diabetes mellitus.

Proteinuria, either from increased leakage from the

glomeruli or from decreased tubular reabsorption, is the most important initial indicator of early renal disease.[6,7] As noted earlier, end-stage renal disease is a major US health problem, consuming 10% of the Medicare Part B budget.[2] Diabetes mellitus is the leading cause (30%) of new cases of ESRD, and hypertension is the second leading cause at 26%.[1,2] As stated earlier, these disorders occur at much higher rates among African Americans than among whites.[1,2]

Several investigators have documented the correlation between proteinuria and the progression of renal failure.[18,19] Also, data from the Framingham study showed that proteinuria, though rare in the healthy population, was increased in the presence of hypertension, diabetes mellitus, and ventricular hypertrophy, and that proteinuria itself was an *independent* risk factor for early mortality.[20]

Our project found a dramatically increased incidence of proteinuria in patients at risk for developing ESRD. In our African American patients with hypertension, there was a statistically significant increase in proteinuria over white patients with hypertension. In our patients with diabetes mellitus, with its high risk of ESRD, the incidence of proteinuria in our African American patients was increased to 41% compared with an incidence of 18% in white patients with diabetes, a trend that approached statistical significance.

Early detection of proteinuria in these at-risk patients has potential clinical implications. There have been a number of early intervention trials showing that proteinuria and renal deterioration can be reduced by therapeutic measures. Evidence points toward increased intraglomerular pressure as a key mechanism in the progression of renal disease and the proteinuria that results.[18,19] Preliminary data (animal trials and early clinical trials involving humans) have demonstrated that dietary restriction of protein and phosphorous and administration of amino acid supplements slow the progression of chronic renal failure and reduce proteinuria.[21–25]

There is another extremely promising treatment option available for patients with diabetes and hypertension who have proteinuria. Short-term trials have shown that ACE inhibitors can reduce proteinuria and protect against renal deterioration in diabetic patients with proteinuria.[26,27] A similar improvement, reducing proteinuria while eliminating new renal lesions, was seen in hypertensive rats treated with an ACE inhibitor.[28] Finally, short-term studies of adults with proteinuria from various chronic renal diseases demonstrate a reduction in proteinuria with ACE inhibitor therapy.[29,30] Although the effects of long-term treatment and the human applicability of these preliminary trials are unclear, the trials raise the intriguing possibility that there are or soon may be dietary and pharmacologic treatment options available for patients with proteinuria who are at risk for developing ESRD.

Our trial showed the value of regular dipstick urinalysis to identify proteinuria in patients at risk for the development of ESRD from hypertension and diabetes mellitus. Dipstick urinalysis is an easy, convenient, inexpensive evaluation that was well accepted by our patients. It can provide invaluable evidence of the development of early renal disease in at-risk patients. We recommend that all patients with diabetes mellitus or hypertension, and especially African Americans, undergo evaluation for proteinuria by dipstick urinalysis at least twice a year.

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