

COMPARISON OF PREDICTIVE VALUE OF 8, 12 AND 24-HOUR PROTEINURIA IN PRE-ECLAMPSIA

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ABSTRACT

Objective: Hypertensive disorders of pregnancy are common major complications of pregnancy and are responsible for significant morbidity and mortality in the fetus the newborn infant and the mother. The objective of this study was to determine if a patient's eight and/or 12-hour urine total protein values correlate with the 24-hour value to confirm the diagnosis of preeclampsia.

Methodology: The study population included 57 patients with hypertensive disorders of pregnancy. Patients' urine was collected over 24 hours with the first 8 hours, next 4 hours, and remaining 12 hours in separate containers. The urine volume and total protein were measured in the 8, 12, and 24-hour samples. The 8 and 12 hour results were compared to the results by use of single regression analysis.

Results: Of the 57 patients, 49 had no proteinuria, six had mild proteinuria, and two had severe proteinuria. The results of the 8- hour sample correlated with those of the 24- hour sample for patients with mild ($P<0.05$) and severe disease ($P<0.05$). The 12 hour sample correlated with the 24-hour sample for patients with no disease ($p<0.02$), mild proteinuria ($P<0.02$), and severe proteinuria ($p<0.01$).

Conclusion: Total protein values for 8- and 12- hour urine samples correlate positively with values for 24-hour samples for patients with proteinuria. The results for 12 and 24 hour samples correlate for patients without proteinuria.

KEY WORDS: Preeclampsia, Proteinuria.

INTRODUCTION

Hypertensive disorders of pregnancy are common major complications of pregnancy and are responsible for significant morbidity and mortality in the fetus, the newborn infant and the mother. This disorder complicates 7% of pregnancies and is classified according to preexisting chronic hypertension or pregnancy-induced hypertension with or without proteinuria.¹ The diagnosis of preeclampsia is

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given by the presence of hypertension accompanied by proteinuria as evident after 20 weeks' gestation.² The gold standard for measuring proteinuria is a 24-hour urine sample for total protein; patients with hypertension have only <300 mg, those with mild preeclampsia have 300 mg to 500 mg, and those with severe preeclampsia may have >500 mg of protein.³ The 24-hour period required for collection of the urine may result in a delay in diagnosis and treatment or possibly a prolonged hospital stay. Shortening the period for the diagnosis of preeclampsia would be valuable for management purposes, as well as for decreasing hospital cost and patient inconvenience. Several investigators have previously reported more rapid methods of identifying proteinuria such as the use of protein-creatinine ratios and dipsticks for protein in random urine specimens.^{5,6} The objective of this study was to

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determine if quantitative measurements of urine protein from 8- and 12-hour samples as compared to those of a 24-hour sample are accurate in diagnosing preeclampsia and in differentiating mild from severe disease in most patients.

PATIENTS AND METHODS

All pregnant patients who were >20 weeks gestation who had provided a 24-hour urine sample for protein and creatinine clearance as recorded by their physicians to rule out preeclampsia were included in the study. Participants in the study were inpatients at Fatemeh Women Hospital or outpatients of this hospital. Patients were excluded from the study only if they did not complete the 24 hours of collection because of delivery. The patients were on modified bed rest, either at home or in the hospital. The urine was collected in three, separate, clearly marked containers. The first container held the first 8 hours of urine, the second container held the next 4 hours of urine, and the third container held the remaining 12-hour urine sample. Total collection time was 24 hours.

The containers were sent to the laboratory of the hospital, where the urine volume in each of the containers was measured separately with use of a graduated cylinder and recorded. Analysis for protein in each of the three aliquots was then performed by using a modified Fugita method.

RESULTS

There were a total of 57 patients with 57 urine samples. Urine specimens were collected at various times throughout the day. The mean proteinuria and mean high systolic blood pressures differed significantly between each the three groups ($P<0.01$). There was no significant difference between the total urine volume, creatinine clearance, and urine creatinine values between the groups.

The 8- hour urine protein results correlated with the 24- hour results for proteins with mild and severe preeclampsia. A receiver operating characteristic curve identified that a value of

<200 mg in the 8- hour sample predicted mild proteinuria with sensitivity of 85% , specificity of 90%, positive predictive value (PPV) of 95%, and negative predictive value (NPV) of 78% ($r=0.80$, $p<.001$). All patients with severe proteinuria had an 8- hour protein result of >2000 mg. By using this cutoff value, clinicians can predict severe proteinuria with a sensitivity of 100%, specificity of 97%, PPV of 89%, and NPV of 100% ($r=.89$, $p=.003$). The 8-hour urine value did not correlate with the 28-hour value for patients without proteinuria.

The values for the 12-hour samples correlated significantly with the 12- hour results for patients with no proteinuria, mild, and severe proteinuria. All patients without disease had <100 mg in 12 hours. A 12- hour value of >100 mg can predict mild proteinuria with the 78% sensitivity and 100 specificity, PPV of 100% and NPV of 71% ($r=0.86$, $P<.001$). All patients with severe proteinuria had values of >2500mg in 12 hours.

DISCUSSION

The results of our study indicate that the protein values for the first 8 or 12 hours of 24-hour urine sampling do correlate with the entire 24- hour sample for patients with the mild and severe proteinuria. A similar correlation was found between the 12- and 24-hour samples for patients who did not meet the criteria of preeclampsia. Therefore, it is evident that an 8- or 12-hour urine sample can predict, or diagnose, mild or severe disease. Total > 650 mg in the 12-hour samples was predictive of mild proteinuria. In this study, 8-hour protein values of >320 mg and 12-hour values of >2500 mg were predictive of severe proteinuria; however, it should be noted that there were only 2 patients in the severe proteinuria group.

Quantitation of proteinuria in preeclampsia is important for diagnosing pre eclampsia and for classifying mild versus severe disease. Currently, the 12-hour urine is the gold standard for the evaluation of proteinuria. A shorter period to diagnosis would have clinical benefits such as shortened time to delivery and

earlier use of antenatal glucocorticoids for fetal pulmonary maturity. Several investigators have explored other means of quantifying proteinuria in a shorter period.^{7,8} The protein-creatinine ratio of a single urine sample from pregnant women has been shown to correlate significantly with a 24-hour collection for patients with protein values of <1 g in 24 hours.⁶ Above this level the variation between the samples is increased. Some workers studied protein-creatinine ratios in pregnant women with preeclampsia but showed that the degree of correlation to the 24-hour sample was lower in patients with values of >2 g/24h.^{9,10} Therefore, the protein-creatinine ratio is not sensitive enough to determine mild versus severe disease for patients with significant proteinuria.¹¹⁻¹³ In addition; results of urine dipstick for protein have also been showed by others to correlate poorly with 24-hour urine samples for differentiating patients with no disease or severe disease. Our study also confirmed that urine dipstick results correlate poorly with the 24-hour samples. Further studies are needed to confirm our results and to generate reliable protein values for predicting mild and severe proteinuria. So far severity of the disease is decided on clinical parameters in addition to albuminuria.

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