

Use of 8-hour and 12-hour Urine Sample for Prediction of Significant Proteinuria

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Abstract: The combination of hypertension and proteinuria such as preeclampsia during pregnancy markedly increases the risk of prenatal mortality and morbidity. 24hour urine protein estimation is the gold standard for assessment of proteinuria. This study was undertaken to determine whether an 8hour & 12hour protein estimation correlated with that of a formal 24hour collection. The study population included 65 pregnant women over 20 weeks gestation with hypertension admitted for assessment of proteinuria in Bandar Abbas Dr. Ali Shariati hospital. Urine samples were collected over 24hours with the first 8hours, next 4 hours, and remaining 12 hours collected in separate containers. The urine volume, and total protein levels were measured in the 8, 12, and 24 hours samples and compared each other. Of 65 patients 35 had no proteinuria, 27 had mild proteinuria and 2 had severe proteinuria. 8 hour sample predicted significant proteinuria with sensitivity of %63, specificity of %91 positive predictive value of %86 and negative predicative value of %82. Total protein values for 8 and especially 12hour sample correlate positively with values of 24hour sample for patients with proteinuria.

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1. Introduction

Hypertension is among the fatal triad of maternal mortality rate (1). Proteinuria is a sign of worsening hypertensive disease, specifically preeclampsia (2, 3). Significant proteinuria is defined by 24hour urinary protein exceeding 300 mg per 24hour, or persistent 30mg/dl (1+ dipstick) in random urine samples (1, 4). The 24hour urine collection has been the gold standard for making the diagnosis of significant proteinuria in patients with pregnancy induced hypertension (5). The test takes the 24hours to complete, which leads to delay diagnosis and inaccurate results as the result of incomplete collection. This precludes the use of a shorter collection period or the use of a random urine sample for protein concentration measurements, the latter of which would be the most practicable. The degree of proteinuria may fluctuate widely over any 24hour period, even in severe cases (6). Therefore, a single random sample may fail to demonstrate significant

proteinuria (7). This study was undertaken to determine whether an 8hour & 12hour protein estimation correlated with that of a formal 24hour collection.

2. Material and Methods

This is a cross-sectional study on pregnant women over 20 week gestation with the diagnosis of Pregnancy Induced Hypertension. The study population included 65 pregnant women in Bandar Abbas Dr. Ali Shariati hospital. Patient's urine was collected over 24hours in the first 8hours, next 4hours, and remaining 12hours collected in separate containers. The urine volume and total protein and creatinine levels were measured in the 8, 12, and 24 hours samples and compared. The first lab test was dipstick test, and then trichloroacetic acid 12.5%. First sample: First, six cc of the 8hour urine were taken. Second sample: the remained sample of 8hour sample plus 4hour sample was added and six cc of

the result solution was considered as the second sample. Third sample: the 12hour sample was added to the 24hour sample and six cc of the solution was examined as the third sample. Proteinuria was defined as 100 mg or more protein in the 8 hour sample, 150 mg in 12hours and 300 mg in 24hours sample. The amount measured was multiplied by 3 and by 2 respectively. Pearson's correlation coefficient, specificity, positive predictive value and negative predictive value were determined. The 8 and 12hour results were compared with the 24hour results by use of simple regression analysis. The Pearson's coefficient was 0.873 and 0.890 respectively.

3. Results

Table 1 and 2 summarizes the results of the study. Of 65 patients 35 had no proteinuria, 27 had mild proteinuria and 3 had severe proteinuria.

Table1. Cases characteristics

Min-max	SD± mean	Details
17-42	29.031± 6.162	Age (yrs)
21-39	31.846± 4.563	Gestational age (weeks)
30-5130	449.9± 765.2	8hour protein
28-5800	507±812	12hour protein
20-2880	418±507.9	24 hour protein
109-1300	532.1±219.3	8 hour urine volume
260-2740	987.1±493	12 hour urine volume
420-3840	1675.2±699.4	24 hour urine volume
0.4-0.8	0.52±8%	Serum Cr

Table 2. Comparing 8 hour and 12 hour random urine collection

12 hour urine	8 hour urine	Random	Cases
28 (43%)	22 (33%)	35 (53%)	Proteinuria cases (%)
24	19	22	positive
4	3	13	False positive
37 (56%)	43 (66%)	30 (46%)	Non proteinuria cases %
32	32	23	Negative
5	11	7	False negative
82%	63%	75%	Sensitivity
88%	91%	63%	Specificity
85%	86%	62%	PPV
86%	82%	76%	NPV

Eight hour sample predicted significant proteinuria with sensitivity of %63, specificity of %91 positive predictive value of %86 & negative

predictive value of %82. 12hour sample predicted significant proteinuria with sensitivity of %82 specificity of %88 positive predictive value of %85 negative predictive value of %86.

4. Discussions

There remains considerable variation in the use of methods for assessing the amount of protein excretion as well as doubts about many of the techniques used (8-11). However it is acknowledged that estimation of urinary protein excretion over a 24h period is the reference, or gold standard, method. This approach, however, is considered by many to be impractical in some circumstances, particularly in the outpatient setting, because of the difficulties associated with obtaining a complete collection. In a study of elderly patients, Mitchell et al. (12) had to discard >20% of the samples returned because they were considered to be incomplete; Chital et al. (13) In their study had to discard 10% of the samples received for similar reasons. The need for a 24h collection is a result of the high degree of variation in the urinary protein concentration during the course of the day. Several authors have investigated the variation in protein excretion during the day and found that values can vary from 100% to 500%. Factors, including (a) variation in water intake and excretion, (b) rate of diuresis, (c) exercise, (d) position, and (e) diet. The variation may be further exacerbated by pathologic changes in blood pressure and renal architecture (6). Although the dipstick technique is fast but it can only measure albumin in the urine and it can make false negative results. It can even have the inter-rater error of measurement (14). Meyer and colleagues detect a 34% negative predictive value and 92% Positive predictive value for dipstick technique (7). Other studies have assessed the value of single voided and 2hour protein estimations... The quantitative assessment of single and 2hour protein specimens has been shown to be accurate when compared with to standard 24hour estimation and were both time and cost- effective. Samantha et al demonstrated moderate correlation between the standard 24hour urinary protein estimation and two hour estimation (15). Otero pinto et al suggested that 8 and 12hour proteinuria can be used as a tool to perform and early diagnosis of preeclampsia (16). Our study shows that total protein values for 8 and specially 12hour sample correlate positively with values of 24hour sample for proteinuria.

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