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Original Article

Comparison of protein/creatinine ratio in single voided urine sample with 24 hours urine protein for estimation of proteinuria in pregnancy induced hypertension

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Abstract

Objectives: To compare protein/creatinine ratio (P:C) in single voided urine sample with 24 hours urine protein for estimation of proteinuria in pregnancy induced hypertension (PIH). *Methods:* A study was conducted in 50 hospitalized pregnant women with gestational age more than 20 weeks with suspicion of pregnancy induced hypertension. Urine sample for 24 hours urine protein followed by next voided spot sample for P:C ratio was collected. Linear regression was used to determine the correlation between 24 hours urine protein and P:C ratio. *Results:* There was a significant correlation between 24 hours urine protein and P:C ratio(r=0.83, P=0.000). These also showed statistically significant linear relationship. *Conclusion:* The spot urinary protein/creatinine ratio appears to be an excellent alternative to 24 hours urine protein. A level above 0.2 is a good indicator of significant proteinuria.

Key words: pregnancy induced hypertension, protein / creatinine (P:C) ratio, proteinuria, 24 hours urine

Introduction

Hypertensive disorder in pregnancy is a common disease. The incidence of pregnancy induced hypertension (PIH) in India range from 5-15% [1]. Reliable diagnostic criteria are needed to distinguish between various forms of pregnancy induced hypertension.

Pregnancy presents a unique opportunity to evaluate and record sequential physiological changes in the female. The accepted upper limit of normal proteinuria in pregnancy is 300 mg/24 hours [2]. Once this level is exceeded for the first time after 20 weeks of gestation in association with hypertension, a diagnosis of gestational proteinuric hypertension can be made. Proteinuria is an important marker of severity or progression of the disease.

Obstetricians currently rely on 24 hours urine collection for determination of proteinuria. However, urine collections during pregnancy can be inadequate because of the pregnancy induced increase in ureteral dead spaces [3]. The collection and analysis is cumbersome and time consuming for both the patient and the laboratory. This has prompted investigation into the use of a single voided urine P:C ratio to estimate proteinuria. This is hypothesized to be preferable to a random spot protein alone because ratio of two stable excretion rates, creatinine and protein, would cancel

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out the time factor and thus provide a better estimate of 24 hour protein excretion [4].

Urinary protein excretion is customarily expressed as the amount of protein excreted per unit of time, factored for body surface area. Since creatinine production and excretion are also related to body size (as well as age and sex), good correlation is expected between the P:C ratio and quantitative urinary protein excretion in individual patients.

This study indicates that, when properly interpreted, the results of measurement of protein and creatinine in single voided urine sample can provide information which for clinical purposes is a satisfactory substitute for 24 hour urine protein in hypertensive pregnant women.

Methods

A study was carried on 50 randomly selected (booked and unbooked) admitted antenatal cases with hypertensive disorders in pregnancy with gestational age >20 weeks. Women with bacteriuria, urinary tract infections, renal disorders and those receiving diuretics were excluded from the study.

24 hour urine collection was started before mid day. First sample was discarded and time was noted. 24 hour urine was collected in a clean bottle and last sample was taken on the next day at the same time. A single voided urine specimen for spot urinary P:C ratio was taken as soon as possible after the completion of 24 hour urine collection.

Urine protein level was measured in both the samples with colorimetric method using pyrogallol red molybdate complex (Fujita Y, Mori I, Kitano S Method) and urine creatinine level was determined by creatinine Jaffe method. Urine proteins were measured on Cobas Integra 400 Auto analyzer and urinary creatinine was measured on the Hitachi 911 Auto analyzer instrument.

Statistical evaluation was done in all the patients. Linear regression was used to determine the correlation between 24 hour urine protein excretion and spot urine P:C ratio.

Results

Table 1 shows the demographic profile of the women under study. Out of the 50 women, 46 (92%) had proteinuria and 4 (8%) had no proteinuria in the 24 hour urine sample. (See table 2).

In spot sample, out of the 50 patients, nine had no proteinuria. So P:C ratio was nil. Thirty one patients had significant proteinuria (P:C ratio >0.2). Out of these 31 patients, four had severe range proteinuria. (P:C >3.5) (See table 3).

Table 1. Demographic profile (n=50).

Age (Years) :		
15-20	1	(2%)
21-25	20	(40%)
26-30	18	(36%)
31-35	11	(22%)
Status of antenatal care		
Booked	24	(48%)
Unbooked	26	(52%)
Gravidity		
Primigravida	22	(44%)
Multigravida	28	(56%)
Period of gestation (weeks)		
20-28 weeks	7	(14%)
29–36 weeks	33	(66%)
≥37 weeks	10	(20%)

Table 2: 24 hours urine protein.

24 hours urinary protein (gm/day)	Number	Percentage
Nil	4	8%
0-0.2	10	20%
0.21-3.5	30	60%
3.5-5.5	6	12%

Table 3. Spot sample protein / creatinine ratio (P:C).

P:C	Number	Percentage
Nil	9	18%
0-0.2	10	20%
0.21-3.5	27	54%
>3.5	4	8%

There was a significant correlation between 24 hour urine protein and P:C ratio (r=0.83, p=0.000). A statistically significant linear relationship between 24 hour urine protein and P:C ratio exists in the PIH cases.

Discussion

24 hour urine collections are often used during pregnancy to quantify proteinuria. For years this has been the standard for the diagnosis and treatment of preeclampsia. However, 24-hour urine collections are cumbersome, subjective to collection error, require patient compliance, and result in a greater than 24 hour delay in diagnosis from the start of the collection [5]. We found an excellent correlation between single voided urine P:C ratio and 24 hour urine protein excretion. Reliance on a voided urine P:C ratio decreases the need for patient compliance, minimizes collection and laboratory errors, and saves almost a day in ascertaining the results.

In our study, mean age was 26.9 years. Our study had found close correlation (r=0.83, p=0.000) between P:C ratio and 24 hour urine protein and also showed statistically significant linear relationship between 24 hour urine protein and P:C ratio.

Several studies showed excellent correlation between protein/creatinine ratio and 24 hour total protein in PIH. Robert M et al found close correlation between the two in 71 hypertensive pregnant women (r=0.94, p<0.001)[6]. Rodriguez-Thompson [7] also showed close correlation in 138 females (r=0.80, p < 0.001). Durnwald [8] found poor correlation between the 220 hypertensive pregnant women ($r^2 = 0.41$).

Conclusion

The use of 24 hour urine collection for the management of proteinuria delays the diagnosis, is difficult and is sometimes unreliable because of incomplete collections. In pregnancy induced hypertension, measurement of the protein/creatinine ratio is a simple and inexpensive alternative to 24 hour urine protein estimate for quantitation of proteinuria.

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