

## SPOT URINE PROTEIN: CREATININE RATIO'S DIAGNOSTIC ACCURACY IN DIAGNOSING PRE-ECLAMPTIC INDIVIDUALS

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### ABSTRACT

**Objective:** To ascertain the spot urine protein: creatinine ratio's diagnostic accuracy in detecting pre-eclamptic patients presenting to the OPD of Ayub Teaching Hospital Abbottabad.

**Study Design:** A-Crosssectional study

**Place and Duration:** Department of Obstetrics & Gynecology, Ayub Teaching Hospital Abbottabad from 24th August 2014 to 23rd February 2015.

**Methodology:** 258 pregnant female patients with gestational amenorrhoea of at least 20 weeks were included in the research using a cross-sectional validation study design. Patients' informed permission was obtained before a thorough history and clinical examination were performed. SPSS version 10.0 was used to analyze the data that was collected. For numerical factors such as age and weeks of gestation at the time of presentation, mean + SD were computed.

**Results:** The sensitivity and specificity of the urine protein-creatinine ratio are 88.46% and 93.67%, respectively. Positive and negative predictive values for the Urine protein-creatinine ratio were 77.97% and 96.98%, respectively. There was no difference in gestational amenorrhoea, age, or parity. ( $p < 0.00$ ).

**Conclusion:** According to our research, the urine protein-creatinine ratio is a quick, easy, and affordable test for identifying preeclampsia in expectant mothers.

**Key Words:** Proteinuria, hypertension, protein-creatinine ratio, preeclampsia, and organ failure.

### INTRODUCTION

Proteinuria and new-onset hypertension are the classic indications and symptoms of preeclampsia, a leading cause of morbidity and mortality among mothers. Proteinuria, hypertension, and organ failure are signs of preeclampsia.

If the 24-hour urine protein total is more than 30 mg/dL, it is abnormal<sup>1</sup>. Severe hypertension oc-

curs when the blood pressure is measured twice, at least four hours apart. The systolic reading is at least 160 mm Hg, and the diastolic reading is at least 110 mm Hg. Other criteria of proteinuria include a urine protein creatinine ratio more than 30 mg/mmol or a concentration of 30 mg/dL in two randomly selected urine specimens collected at least 4 hours apart (but within 7 days)<sup>2</sup>.

In 3 to 5% of pregnant women, this systemic sickness manifests after 20 weeks of gestation<sup>3</sup>. Pregnancy-related hypertension diseases account for over 26% of maternal fatalities in Latin America and the Caribbean, compared to 9% in Africa and Asia. 16% of maternal deaths in low-income countries are related to hypertension conditions; in high-income countries, this percentage is much too low<sup>4</sup>.

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Pakistan has been reported to have an exceptionally high death rate, with 260 fatalities for every 100,000 live births<sup>5</sup>. (preeclampsia) is 20% more common in women with pregnancy-induced hypertension, according to recent research by Riaz et al.<sup>6</sup>

Because (preeclampsia) may manifest atypically or when it is superimposed on another condition, the existing diagnostic criteria for (preeclampsia) may not always be useful in making the diagnosis of (preeclampsia).

The atypical instances are (signs and symptoms) of preeclampsia that emerge before 20 weeks of gestation or 48 hours after birth, without hypertension or proteinuria<sup>7</sup>. The maternal spot urine protein to creatinine ratio shows potential diagnostic relevance for severe proteinuria in cases of suspected preeclampsia<sup>8</sup>. Spot urine albumin creatinine ratio (ACR) assays employing high-performance liquid chromatography, according to Baweja et al., provide better findings in simple and early scenarios. ACR values of 35.5 mg/mmol or above may be used to diagnose (preeclampsia) in the early stages of the second trimester, before symptoms manifest<sup>9</sup>.

Comparing spot urine ACR to 24-hour urine protein excretion, another research discovered that the former is a more straightforward, practical, and reliable diagnostic of severe proteinuria in preeclamptic individuals.<sup>10</sup> In a similar vein, Park et al. have shown that the random urine protein creatinine ratio is indicative of consequential proteinuria in preeclampsia and may support its usefulness in early diagnostic data when compared to the pee dipstick test and 24-hour urine protein excretion<sup>11</sup>.

Nonetheless, the most reliable method for identifying preeclampsia is the 24-hour urine-protein excretion examination<sup>12</sup>. The spot urine protein-creatinine ratio's sensitivity, specificity, and prevalence are 87.5%, 84.2%, and 74.2%, respectively, according to Mohseni et al<sup>13</sup>.

The goal of the present research is to ascertain if the spot urine protein creatinine ratio might serve as a reliable, efficient, and uncomplicated indicator of (preeclampsia) in pregnant women residing in this area.

The observations will be shared with other medical professionals in the area to build or amend recommendations in the future for routine patient follow-ups about prenatal care of patients who may

have (preeclampsia) risk factors.

## METHODOLOGY

From August 24, 2014, to February 23, 2015, the Ayub Teaching Hospital in Abbottabad conducted a cross-sectional validation study in obstetrics and gynecology. In this study, 258 pregnant women were included. Patients were assessed with informed consent and hospital ethics committee approval. Every pregnant OPD patient was considered for the experiment. Patients between 20 and 40 with any gravidity and at least 20 weeks gestation were considered. Patients with essential hypertension, cardiac disease, liver dysfunction, renal dysfunction, seizure disorders, diabetes mellitus, or any combination of these illnesses were excluded.

Each study participant got a full clinical history and physical assessment. Patients submitted an early morning urine sample to measure the spot urine-creatinine ratio. Urine protein excretion was measured in each person's 24-hour urine sample. Consultant obstetricians thoroughly oversaw patient evaluation and treatment. A leading pathologist at Ayub Medical College assessed the spot urine creatinine ratio and calculated 24-hour urine protein excretion. The 24-hour urine protein test was compared to the spot urine protein-creatinine ratio to establish accuracy.

This study's sample size was 258 using the WHO Sample Size Determination in Health Studies software, with a spot urine protein creatinine ratio sensitivity of 87.5% and specificity of 84.2%<sup>13</sup>. The expected prevalence is 74.2%<sup>13</sup>, with a 95% confidence interval and 5% margin of error. We employed successive non-probability sampling.

Data was analyzed using SPSS 10.0. The mean + SD was calculated for numerical parameters such as age and weeks of gestation at presentation. Category variables such as parity, preeclampsia on spot urine protein-creatinine ratio, and 24-hour urinary protein were calculated as frequencies and percentages.

## RESULT

After eliminating potential confounding factors, 258 pregnant women were included in this study. Research individuals had an average age of  $29.03 \pm 3.71$  years. Patients aged 23–35 were considered. These patients had a mean gestational amenorrhoea of  $28.52 \pm 4.76$  weeks. The longest gestational amenor-

rhoea was 36 weeks, and the shortest was 21 weeks. Urine protein-creatinine ratio testing identified preeclampsia in 59 individuals (22.87%). However, 52 (20.16%) exhibited preeclampsia after 24 hours of urine protein excretion. Most research participants (20.54%) were nulliparous and (Para) 1.

The urine protein-creatinine ratio detected preeclampsia with 88.46% sensitivity and 93.67% specificity. The urine protein-creatinine ratio had 77.97% positive and 96.98% negative predictive values. Preeclampsia was diagnosed with 92.63% accuracy using the Urine protein-creatinine ratio.

Urine protein creatinine ratio and 24-hour urine protein were strongly associated ( $p$  0.00) by age, parity,

**Table 1: Statistics of age and gestational amenorrhea of under study patients**

|                    | Age   | Gestational amenorrhea |
|--------------------|-------|------------------------|
| N                  | 258   | 258                    |
| Mean               | 29.03 | 28.52                  |
| Standard Deviation | 3.71  | 4.76                   |
| Minimum            | 23.00 | 21.00                  |
| Maximum            | 35.00 | 36.00                  |

**Table 2: Parity in study population**

| Parity of study participants | Frequency | Percent |
|------------------------------|-----------|---------|
| Nulliparous                  | 53        | 20.54   |
| Para 1                       | 53        | 20.54   |
| Para 2                       | 59        | 22.87   |
| Para 3                       | 42        | 16.28   |
| Para 4                       | 29        | 11.24   |
| Para 5                       | 22        | 8.53    |
| Total                        | 258       | 100.0   |

**Table 3: Dignosis of Pre Eclampsia on Urine Protein-Creatinin Ratio vs 24-Hr Surinary Protien Excretion Measurement**

|                       | Urine Protien-creatinine ratio |         | 24-hr urinary protein excretion measurement |         |
|-----------------------|--------------------------------|---------|---|---------|
|                       | Frequency                      | Percent | Frequency                                   | Percent |
| Pre-eclampsia Present | 52                             | 20.16   | 59  | 22.87   |
| Pre-eclampsia absent  | 206                            | 79.84   | 199   | 77.13   |
| Total                 | 258                            | 100.0   | 258   | 100.0   |

**Table 4: Cross-tabulation of Urine protein-creatinine ratio and 24 hour protein excretion for the diagnosis of pre-eclampsia**

| Urine Protein:Creatinine ratio | 24 hours urinary protein |                      | Total  | p value |
|--------------------------------|--------------------------|----------------------|--------|---------|
|                                | Pre-eclampsia Present    | Pre-eclampsia Absent |        |         |
| Pre-eclampsia Present          | 46.00                    | 13.00                | 59.00  | 0.00    |
| Pre-eclampsia Absent           | 6.00                     | 193.00               | 199.00 |         |
| Total                          | 52.00                    | 206.00               | 258.00 |         |

and gestational amenorrhoea. Every result is tabulated.

## DISCUSSION

In both industrialized and developing nations, (preeclampsia) is a frequent cause of illness and death among mothers and perinatal. The only effective therapy is early delivery, which often results in premature birth. Globally, early intervention has a major influence on the health of mothers and infants.

According to this research, the urine protein-creatinine ratio has a sensitivity of 88.46% and a specificity of 93.67% in identifying preeclampsia. The urine protein-creatinine ratio has a positive predictive value of 77.97% and a negative predictive value of 96.98%, respectively. The urine protein-creatinine ratio was shown to have a 92.63% diagnostic accuracy for preeclampsia.

These outcomes are consistent with those published globally. McTaggart et al. recently reported the urine albumin creatinine ratio's sensitivity and specificity for identifying albuminuria to be 83.2% and 80.0%, respectively. 51.2% and 95.0%, respectively, were the (positive and negative predictive) values <sup>14</sup>.

Similarly, Nisell et al. discovered a robust relationship between albumin excretion levels evaluated over 24 hours and the albumin-creatinine ratio <sup>15</sup>.

They found that for identifying albuminuria >300 mg/24 h, the sensitivity and positive predictive value were 95 and 100%, respectively, while the specificity and negative values were 100 and 86%.

According to Amin et al., the random urine protein: creatinine ratio is a much more accurate test to determine proteinuria in hypertensive pregnant women than the dipstick approach <sup>16</sup>. The 24-hour findings were compared to dipstick estimate and UPCR. They

discovered that, given a cutoff value of 0.45, the area under the curve for UPCR was 0.89 (95% CI: 0.83 to 0.95), indicating 82% sensitivity and a 12.5% false positive rate. Greater cutoff values (1.46 and 1.83, respectively) indicated heavy proteinuria (2 g and 3 g/24 h) <sup>16</sup>.

## CONCLUSION

The spot urine protein to creatinine ratio is a quick, easy, and reliable way to identify (preeclampsia) in expectant mothers. The saved time may be put to greater use when managing pre-eclamptic patients.

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**CONFLICT OF INTEREST:** Authors declare no conflict of interest  
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