ORIGINAL RESEARCH

Assessment of relation between spot urine protein- creatinine ratio in women with pre-eclampsia in association with 24 hours urinary protein excretion

[1]Dr. Mitali Mukhopadhyay, [2]Dr. Santanu Banerjee

[1]Associate Professor, Department of Obstetrics and Gynaecology, JIS School of Medical Science & Research, Domjur, Howrah, West Bengal, India
[2]Associate Professor, Department of Medicine, JIS School of Medical Science & Research, Domjur, Howrah, West Bengal, India

Corresponding author
Dr. Mitali Mukhopadhyay
Associate Professor, Department of Obstetrics and Gynaecology, JIS School of Medical Science & Research, Domjur, Howrah, West Bengal, India

ABSTRACT
Background: Pre-eclampsia is a multisystem condition that usually appears in the 20th week of pregnancy. The present study was spot urine protein- creatinine ratio in women with pre-eclampsia in association with 24 hours urinary protein excretion. **Methods:** 86 women age 18 to 42 years of age was recruited. Parameters such as gestational age (weeks), gravidity and parity, and maternal age, 24-hours urinary protein excretion, random urinary creatinine, random urinary protein-to-creatinine ratio etc. was recorded. **Results:** The mean 24-hours urinary protein excretion in age group 18-26 years was 2612.3 mg/d, in age group 26-34 years was 1745.1 mg/d and in age group 34-42 years was 1685.2 mg/d. The difference was significant (P< 0.05). The mean protein to creatinine ratio in age group 18-26 years was 3.71 mg/g, in 26-34 years was 3.42 mg/g and in 34-42 years was 1.75 mg/g. The difference was significant (P< 0.05). There was positive correlation between 24- hour urinary protein excretion& random protein to creatinine ratio (r- 0.51, p<0.05). **Conclusion:** There was relationshipbetween 24-hour urine protein excretion rate and protein/creatinine ratio in random urine specimen of women with preeclampsia.
Keywords: Pre-eclampsia, protein to creatinine ratio, urinary protein

INTRODUCTION

Pre-eclampsia is a multisystem condition that usually appears in the 20th week of pregnancy. It affects 2 to 8% of pregnancies globally and 10% of pregnancies in developing nations. It is often associated with renal failure as a consequence.[1] Miscarriage, premature labor, low birth weight, fetal growth restriction (FGR), and an elevated risk of postpartum respiratory distress syndrome are all known outcomes of these diseases.[2]

Non–severe preeclampsia is defined as hypertension (systolic and diastolic blood pressure greater than 140 and 90 mmHg, respectively) and proteinuria (24-hour urinary protein excretion greater than or equal to 300 mg/d) or theprotein-to-creatinine ratio in a random urine sample (equivalent to 0.3 mg/dL) after 20 weeks of gestation.[3] Severe pre-eclampsia is defined as systolic pressure greater than 160 mmHg or diastolic pressure greater than 110 mmHg accompanied with proteinuria of more than 300 mg/d.[4]

Prenatal screening procedures for preeclampsia are based on routine measurements of blood pressure and urine protein levels.[5] A 24-hour urine collection test, the gold standard, is always performed following this initial screening due to the high likelihood of false negative and false positive results from urinalysis. Urine samples cannot usually be obtained for 24 hours, and this test has flaws.[6]The present study was spot urine protein- creatinine ratio in women with pre-eclampsia in association with 24 hours urinary protein excretion.

MATERIALS & METHODS

The study was carried outon 86 women age 18 to 42 years of age. Inclusion criteria was hypertension (systolic blood pressure of equal or greater than 140

mmHg and diastolic blood pressure of equal or greater than 90 mmHg or both), gestational age ≥ 20 weeks, proteinuria 1+ in random urine sample or above 300 mg/d in 24-hours, platelets below 100,000, creatinine above 1.2, doubling of liver enzymes, neurologic symptoms of headache and blurred vision, and eclamptic seizures. All gave their written consent to participate in the study.

Data such as name, age, etc. was recorded. Parameters such as gestational age (weeks), gravidity and parity, and maternal age, 24-hours urinary protein excretion, random urinary creatinine, random urinary protein-to-creatinine ratio etc. was recorded. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS
Table IAssessment of mean 24-hour urinary protein excretion

Age group (years)	Mean	P value
18-26	2612.3	0.04
26-34	1745.1	
34-42	1685.2	

Table I shows that the mean 24-hours urinary protein excretion in age group 18-26 years was 2612.3 mg/d, in age group 26-34 years was 1745.1 mg/d and in age group 34-42 years was 1685.2 mg/d. The difference was significant (P< 0.05).

Table II Assessment of protein to creatinine ratio of the random urine sample

Age group (years)	Mean	P value
18-26	3.71	0.05
26-34	3.42	
34-42	1.75	

Table II shows that mean protein to creatinine ratio in age group 18-26 years was 3.71 mg/g, in 26-34 years was 3.42 mg/gand in 34-42 years was 1.75 mg/g. The difference was significant (P< 0.05).

Table III Correlation between 24- hour urinary protein excretion&random protein to creatinine ratio

Parameter	R value	P value
24- hour urinary protein excretion	0.51	0.01

Table III shows that there was positive correlation between 24- hour urinary protein excretion& random protein to creatinine ratio (r- 0.51, p<0.05).

DISCUSSION
The gold standard for determining whether or not a person has proteinuria is currently 24-hour urine protein testing.[7] Reduced rates of early labor and early glucocorticoid therapy will come from shortening the test length, use the protein to creatinine ratio rather than 24-hour urine protein, and early detection of proteinuria.[8]Non-severe preeclampsia is defined as the presence of new onset proteinuria (more than or equal to 300 mg/d) or protein-to-creatinine ratio (0.3 mg/

dL) equivalent after 20 weeks in more than one random urine sample, as well as the development of hypertension (systolic and diastolic over 140 and 90 mmHg, respectively.[9] Preeclampsia that is considered to be severe has a systolic pressure larger than or equal to 160 mmHg or a diastolic pressure greater than or equal to 110 mmHg, together with proteinuria that may are accompanied by endorgan symptoms.16 In gestational hypertension, the diagnostic criteria is BP ≥ 140/90 and proteinuria less than 300 mg.[10]The present study was spot urine protein- creatinine ratio in women with pre-eclampsia in association with 24 hours urinary protein excretion.

We found that the mean 24-hours urinary protein excretion in age group 18-26 years was 2612.3 mg/d, in age group 26-34 years was 1745.1 mg/d and in age group 34-42 years was 1685.2 mg/d. Farzaneh F et al[11]examined the ratio of protein to creatinine in a random urine sample and its relationship to the rate of 24-hour urine protein excretion for quick detection and prompt management of this condition in women with preeclampsia. 60 pregnant women with preeclampsia were recruited. The 24-hour urine protein excretion and the ratio of protein to creatinine in a random urine sample were compared in these patients. The results showed that there was a positive correlation between the 24-hour urinary protein excretion and the protein to creatinine ratio of the random urine sample in preeclampsia (P < .001, r = 0.515). Women with a higher 24-hour protein excretion also had a higher urinary protein to creatinine ratio.

We found that mean protein to creatinine ratio in age group 18-26 years was 3.71 mg/g, in 26-34 years was 3.42 mg/g and in 34-42 years was 1.75 mg/g. There was positive correlation between 24- hour urinary protein excretion& random protein to creatinine ratio (r- 0.51, p<0.05). Hossain N et al[12]compared the efficacy of spot urinary protein/creatinine ratio with 24h urinary protein excretion in women with pre-eclampsia.A total of 85 women with hypertensive disorders during pregnancy were prospectively studied. Urine protein/creatinine ratio in spot urine sample was compared with 24h urinary protein. Sensitivity and specificity for urinary spot P/C (protein/creatinine) ratio was assessed, and receiver operating curve was used to determine the value against the gold standard of >300mg proteinuria in 24hours urinary sample.Of 85 women, complete data were available for 81 women. There was a strong correlation between spot urinary P/C ratio and 24hours urine protein excretion (r=0.81, P value <0.000). The optimal spot P/C ratio cut-off point was 0.14 for 300mg/24hours of protein excretion (preeclampsia) with a sensitivity of 82% and specificity of 79%.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that there was relationship between 24-hour urine protein excretion rate and protein/creatinine ratio in random urine specimen of women with preeclampsia.

REFERENCES

1. Lei T, Qiu T, Liao W, et al. Proteinuria may be an indicator of adverse pregnancy outcomes in patients with preeclampsia: a retrospective study. Reproductive Biology and Endocrinology. 2021;19(1):1-8.
2. Teeuw HM, Amoakoh HB, Ellis CA, et al. Diagnostic accuracy of urine dipstick tests for proteinuria in pregnant women suspected of preeclampsia: a systematic review and meta-analysis. Pregnancy Hypertension. 2022.
3. Tzur Y, Rimon E, Geva G, et al. Progression from isolated gestational proteinuria to preeclampsia with severe features. Acta Obstetricia et Gynecologica Scandinavica. 2021;100(9):1620-6.
4. Durnwald C, Mercer B. A prospective comparison of total protein/creatinine ratio versus 24-hour urine protein in women with suspected preeclampsia. American journal of obstetrics and gynecology. 2003;189(3):848-52.
5. Saha A, Gupta AD. Study of changes in biochemical parameters of preeclampsia patients, a prospective five- years study. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2022;11(2):517-22.
6. Wiles K, Stillman IE, Conrad KP. The Kidney in Normal Pregnancy and Preeclampsia. Chesley's Hypertensive Disorders in Pregnancy: Elsevier; 2022. p. 289-334.
7. Baca KM, Simhan HN, Platt RW, et al. Low maternal 25-hydroxyvitamin D concentration increases the risk of severe and mild preeclampsia. Annals of epidemiology. 2016;26(12):853-7.
8. Mohseni SM, Moez N, Naghizadeh MM, et al. Correlation of random urinary protein to creatinine ratio in 24-hour urine samples of pregnant women with preeclampsia. Journal of family & reproductive health. 2013;7(2):95.
9. Demirci O, Kumru P, Arınkan A, et al. Spot protein/ creatinine ratio in preeclampsia as an alternative for 24- hour urine protein. Balkan medical journal. 2015;32(1):51.
10. Zadehmodarres S, Razzaghi MR, Habibi G, et al. Random urine protein to creatinine ratio as a diagnostic method of significant proteinuria in pre-eclampsia. Australian and New Zealand journal of obstetrics and gynaecology. 2006;46(6):501-4.
11. Farzaneh F, Alidadi A, Payandeh A, Ajdary M, Eslahi N, Pahlavanravi A, Mirgaloybayat S. Study of The Relationship Between 24-hour Urine Protein Excretion Rate and Protein/Creatinine Ratio in Random Urine Specimen of Women with Preeclampsia. Iranian Journal of Kidney Diseases. 2023 Jul 1;17(4):184-90.
12. Hossain N, Khan N, Shah N, Shah T, Butt S, Khanani R. Spot urine protein–creatinine ratio and 24-h urine protein excretion: Diagnostic accuracy in women with pre-eclampsia. Pregnancy Hypertension: An International Journal of Women's Cardiovascular Health. 2014 Jan 1;4(1):87-90.