Journal of Chitwan Medical College 2019;9(30):57-60
Available online at: www.jcmc.cmc.edu.np

ORIGINAL RESEARCH ARTICLE

CORRELATION BETWEEN 12-HOUR AND 24-HOUR URINE TOTAL PROTEIN IN PREGNANT WOMEN WITH PREECLAMPSIA

Shree Prasad Adhikari[1,*], Jewan Pariyar[2]

[1]Department of Obstetrics and Gynecology, Paropakar Maternity and Women's Hospital, Kathmandu
[2]Department of Obstetrics and Gynecology, Bharatpur Hospital, Chitwan

Received: 29 Aug, 2019

Accepted: 27 Nov 2019

Published: 27 Dec, 2019

Key words: Preeclampsia; Proteinuria; 12-hour urinary total protein.

***Correspondence to:** Shree Prasad Adhikari, Paropakar Maternity and Women's Hospital, Kathmandu. Nepal.
Email: **shreeprasad2063@gmail.com**

DOI:**https://doi.org/10.3126/jcmc.v9i4.26903**

Citation

Adhikari SP, Pariyar J. Correlation between 12-hour and 24-hour urine total protein in pregnant women with preeclampsia.2019;9(30):57-60.

ABSTRACT

Background: Although 24-hour urine total protein (UTP) measurement is the gold standard method for detecting proteinuria in preeclamptic women, the procedure is lengthy and time consuming that might result in delay in diagnosis of the condition. This study aimed at determining the correlation between these 2 parameters.

Methods: This was a cross-sectional study done on 50 pregnant women with preeclampsia admitted at Bharatpur Hospital from September 2018 - January 2019. Patient with preeclampsia and having albumin ≥1 on urine dipstick, the sample was collected in every 12 hours interval on two separate well labeled container with the assistance of nursing staff. Total urine protein at 12-hour and 24-hour were measured by spectrophotometric method. The data were analyzed using SPSS version 21. Correlation between the 2 measurements was analyzed using Spearman's rank correlation coefficient. $p<0.01$ was considered to be statistically significant.

Results: The age of participants ranged between 20-38 years (Mean age: 26.6 years). The maximum occurrence of preeclampsia was observed in primigravid women and younger age group (between 20-25 years), 72% had mild preeclampsia and 28% developed severe preeclampsia. There was a significant correlation between 12-hour and 24-hour UTP (Spearman's $r = 0.99$, $p<0.001$).

Conclusions: There is a strong correlation between 12- and 24-hour urine total protein measurements in women with preeclampsia. 12-hour UTP can be used as an alternative for the assessment of proteinuria in these women, with benefits such as early diagnosis and better patient compliance.

INTRODUCTION

Hypertensive disorder is one of the most common medical complications during pregnancy, which affects 12-22% of pregnancies worldwide.[1] It accounts for approximately 15% of preterm deliveries and represent the second leading cause of morbidity and mortality .[1,2,3] Preeclampsia is a pregnancy specific syndrome that occurs after 20 weeks period of gestation, which is defined by increased blood pressure of 140/90 mmHg or more on two occasions at least 6 hours apart with proteinuria in a previously normotensive and non-proteinuric women. An exact incidence of preeclampsia is still unknown among Nepalese women, one retrospective analysis done in a maternity hospital in Nepal reported an incidence of eclampsia as 2.9 per 1000 deliveries.[4]

Hypertension is an important factor in the diagnosis of preeclampsia, it is strongly suggested to consider the presence of degree of proteinuria as another essential criterion to assure the diagnosis.[5] Proteinuria is an important objective diagnostic criterion, the more severe the proteinuria and the more certain is the diagnosis of preeclampsia.[6,7] Proteinuria (24-hour urine total protein (UTP) ≥ 0.3 g or persistent urine protein 1+ on dipstick test) must be present to make a diagnosis of preeclampsia. Urinary protein excretion in preeclampsia increases gradually and is of variable magnitude owing to variation in vasoconstriction and vasospasm, the hallmark of the condition.[6]

Although there are easy and convenient methods like dipstick method and urine protein creatinine ratio (UPC) as a rapid test to streamline the diagnosis of preeclampsia but in dipstick method has more false positive results, possibly due to contamination of urine by vaginal discharge, antiseptics, concentrated urine and urinary tract infections[10] and has no consensus exists regarding the utility of or optimal cutoff value for UPC in identifying proteinuria.[13]

Only one random urine sample in assessment of significant proteinuria might not be adequate.[5,10-12] Precise detection of urine protein is therefore possible only through measuring the 24-hour urine protein extraction and hence a 24-hour urine analysis has been considered as the gold standard.[5]

Even though 24-hour urine protein measurement is the gold standard method, the procedure is lengthy and time consuming, so compliance rate is not very high. 12-hour UTP has been shown in several studies to be one of the better alternatives

to 24-hour urine collection. The objective of this study was to determine the correlation between 12-hour (a shorter period urine collection) and 24-hour (a longer period, considered the gold standard) UTP estimation.

METHODS

This prospective comparative study included 50 pregnant women diagnosed as preeclampsia (after 20 weeks of gestation, blood pressure ≥140/90 mm Hg and 1+or more proteinuria on urinary dipstick) admitted in Obstetrics and Gynecology Department, Bharatpur Hospital. Bharatpur hospital is a tertiary care center located at Bharatpur, Chitwan with total deliveries of fifteen thousand per year and 4% incidence of preeclampsia according to labor room audit 2073/74. The study was carried out from September 2018 to January 2019. Before enrollment in the study, they were informed and written consent were taken. Patients who had preeclampsia with chronic hypertension, diabetes mellitus, pre-existing renal diseases, urinary tract infection and preexisting proteinuria were excluded.

Urine sample of patients who were enrolled in the study was collected in every 12 hours interval in two separate well labeled containers. Proteinuria of 12 hours was first tested then the sample was mixed with next 12 hours urine sample and test was repeated. The test was done in hospital laboratory by using pyrogallol method. The patients were managed as per the existing protocol of the hospital and were followed till delivery.

The data were analyzed using SPSS version 21. Data was expressed in terms of mean ± standard deviation, median (range), percentage as appropriate. The correlation between 12-hour urine total protein and 24-hour urine total protein was done by Spearman's test. $P < 0.01$ was considered statistically significant.

RESULTS

The mean age of the patients (n =50) was 26.6 years, age range is from 20-38 years. The frequency of preeclampsia was highest in 20-25 years age group (46.0 %) and lowest in >35 years group (2.0 %). The maximum cases were in women with primigravid (54.0%). Furthermore, maximum number of cases (58%) was diagnosed between 33-36 weeks period of gestation and only few cases (6%) were diagnosed between 20-28 weeks period of gestation. Upon follow up, 70% of cases delivered after 37 weeks of gestation and only 2% delivered at 29-32 weeks of gestation (mean gestational age at delivery: 36.98 weeks). (Table 1)

Seventy two (72%) of the cases had mild preeclampsia and the remaining 28% had severe preeclampsia (Table 2).

Table 1: General Characteristics

General Characteristics	Number (%)
Age Group (yrs)	
20-25	23 (46)
26-30	21(42)
31-35	5 (10)
>35	1 (2)
Gravida	
G1	27 (54)
G2-G4	22 (44)
>G5	1 (2)
Gestational Age(wks)	
20-28	3 (6)
29-32	5 (10)
33-36	29 (58)
37 or more	13 (26)
Period of gestation(wks)	
29-32	1 (2)
33-36	14 (28)
37 or more	35 (70)

Seventy two (72%) of the cases had mild preeclampsia and the remaining 28% had severe preeclampsia (Table 2).

Table 2: Mild and Severe Preeclampsia

Mild and Severe Preeclampsia	Number (%)
Mild Preeclampsia	36 (72)
Severe Preeclampsia	14 (28)

The mean 24-hour urine total protein was 0.97± 1.54 g (Range: 0.2 – 6.8 g).. Likewise, the mean 12-hour urine total protein was 0.47 ± 0.76 g (Range: 0.08 – 3.3 g). There was high degree of positive correlation between 12-hour and 24-hour UTP (Spearman's r = 0.99, p<0.001) (Figure 1).

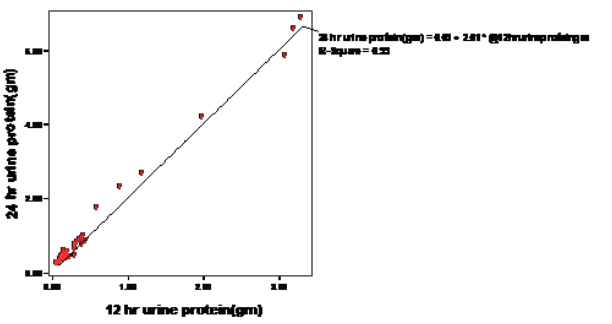

Figure 1: Correlation between 12 hour and 24 hour urine protein

ISSN 2091-2889 (Online) ISSN 2091-2412 (Print) JCMC/ Vol 9/ No. 4/ Issue 30/ Oct-Dec, 2019

DISCUSSION

Preeclampsia is a major cause of maternal and perinatal morbidity and mortality in both the developed and developing countries. It is the most serious form of hypertensive disorders of pregnancy supposedly induced by factors based on the presence of placenta.[22]

The mean maternal age of the patients enrolled in this study is 26 while the similar study conducted by Singhal et al, Rhinert et al, and Tara et al was24.58 ±3.90 years, 25 ± 6.5 years and 25 years respectively[14,20,21]. Probability of occurrence of preeclampsia has been higher in early and late age pregnancy. The information from collective studies in Shiraz, Southern Iran does suggest the higher incidence of preeclampsia in younger women[15], though there is no distinct variation in age but resemble to some extent with this study. Studies of entire population in Aberdeen, Jerusalem and Finland do not indicate an increase incidence of preeclampsia in young women if parity is considered. Mustafa et al. noted that preeclampsia occurred in 5.6% of the primiparas and 0.3% multiparas among well characterized population in Scotland.[16] Other authors have confirmed that nulliparous women are five to ten times more likely to have preeclampsia than multiparous women that has also been seen in our study where 54% nulliparous. Incidence of preeclampsia has been shown to decrease with increasing gravida controlling the age of women.[18,19]

Most of our participants (58%) developed preeclampsia at late weeks of gestation and remaining 42% developed at early weeks similar result been shown by Singhal et al i.e 60% at 29-36 weeks of gestation[14]. According to Arias and associates, pregnant women who were diagnosed in earlier gestational age had a significant potential for severe complication.[20]

24-hour UTP measurement is the best method for diagnosis of preeclampsia but it is time consuming, cumbersome and can enhance many medical and managerial complications because of delayed diagnosis. Our study revealed strong correlation between 12- and 24-hour UTP measurements in preeclamptic women. The findings of this study indicate that the collection of a 12 hour urine specimen can be as accurate as the longer 24 hour collection to estimate amount of proteinuria in admitted pregnant women being evaluated for preeclampsia. Similar finding has been observed by Rinehart et al.[20] The finding is also supported by another study by Taneja **et.al** (Chandigarh, India) where they found meaningful correlation of 8- and 12-hour UTP with 24- hour UTP measurements.[8] A study by Alavi **et.al** also revealed that the UTP measurements at 8 and 12 hours have good correlations with the 24-hour UTP measurements in patients with both mild and severe preeclampsia.[1] Singhal **et.al** observed a significant correlation between 2,4,8,12 and 24 hour proteinuria.[14]

The findings of our study and the results from other related studies suggest that 12-hour UTP could be substituted for assessment of proteinuria over 24-hour UTP in women with preeclampsia as a simpler, faster and cheaper method for diagnosis of preeclampsia and early initiation of management.

CONCLUSION

In our context from the management point of view 12 hour urinary protein is equally effective assessment tool for preeclampsia and its severity.

CONFLICT OF INTEREST

None

FINANCIAL DISCLOSURE

None

REFERENCES:

1. Alavi MH and Lavasani Z. Comparative Evaluation of Quantative Protein Measurement in 8-12 and 24 hour urine samples for diagnosis of preeclampsia. Medical Journal of the Islamic Replubic of Iran. 2006 May;20(1): 23-27. **[LINK]**
2. Goldenberg RL, Rouse DJ. Prevention of premature birth. N Engl J Med. 1998;339:313–320. **[PMID]**
3. Berg CJ, Chang J, Callaghan WM, Whitehead SJ. Pregnancy-related mortality in the United States, 1991-1997. Obstet Gynecol. 2003;101:289–296. **[DOI]**
4. Chaudhary P. Eclampsia: a hospital based retrospective study. Kath Univ Med J. 2002;1(4):237-41. **[PMID]**
5. Asgharnia M, Faraji R,Mirhaghjoo N, Akthar Z, Asohrefkani B, Moslehi M. Survey of predictive value of 4 hour urine collection for diagnosis of proteinuria in preeclampsia. Iran J Repord Med. 2013Aug;11(8). **[PMID]**
6. Cunningham FG, Leveno KJ, Bloom SL, et al. Williams Obstetrics. 23nd Ed. NewYork: Mcgraw-Hill; 2010. pp. 761–775.
7. Somanathan N, Farrel T, Galimberti A. A comparison between 24-hour and 2-hour urine collection for thedetermination of proteinuria. J Obstet Gynecol. 2003;23:378–380. **[DOI]**
8. Taneja A, Gupta I, Dhaliwal LK, and Wangkheimayum S. Correlation of 8 and 12 hour Urine Protein with 24 hour Urinary Protein in Preeclampsia. International Journal of Gynecology and Obstetrics 2006; 92: 124-125. **[DOI]**
9. Adhikari R, Sharma G.R, Dhungana P.R, Gautam Adhikari K. Is urine dipstick as accurate as 24 hour urine protein? A comparative study. Medical Journal of Pokhara (MJPAHS). 2018 Jul-Dec; 1(2). **[DOI]**
10. Ragip A, Bayalk C, Karacacy O, Geyik P, DolenI A. Random urine protein geratinine ratio to prdict proteinuria in new onset mild hypertention in late pregnancy. Obstet Gynecol. 2004;104:367–370. **[DOI]**
11. Rodrigues-thompson DR, Liebeman E. Use of a random urinary protein to geratenine ratio for during pregnancy. Am J Obstet Gynecol. 2001;85:808–811. **[DOI]**
12. Waugh JJ, Clark TJ, Divakaran TG, Khan KS, Kilby MD. Accuracy of urinalysis dipstick techniques in predicting significant proteinuria in pregnancy. Obstet Gynecol. 2004;103:769–777. **[DOI]**
13. Stout MJ, Scifres CM, Stamilio DM. Diagnostic utility of urine protein to creatinine ratio for identifying proteinuria in Pregnancy. J Matern Fetal Neonatal Med.2013 Jan;26(1):66-70: **[DOI]**
14. Singhal SR, Ghalaut B, Lata S, Madan H, Kadian V, Sachdeva A. Correlation of 2 hour, 4 hour, 8 hour, 12 hour urine protein with and 24 hour urine

protein in preeclampsia. J Family Reprod Health. 2014 Sept; 8(3):131-134. [PMID]

15. Zibaeenezhad MJ, Ghodsi M, Arab P, Gholzom N. The Prevalence of Hypertensive Disorders of Pregnancy in Shiraz, Southern Iran. Iranian Cardiovascular Research Journal (ICRJ). 2010; Vol 4 (4). [LINK]
16. Mustafa R, Ahmed S, Gupta A, Venuto RC. A comprehensive review of hypertension in pregnancy. J Pregnancy. 2012;2012:105918. [DOI]
17. Adelberg A.M., Miller J., Doerzbacher M. and lambers D.S. Correlation of Quantative Protein Measurement in 8-12 and 24 hour Urine Samples for the Diagnosis of Preeclampsia. Am J Obstet Gynecol. 2001 October; 185(4):804-7. [DOI]
18. Abebe J, Eligbefoh J, Isabu P, Okogbenin S, Eifediyi R, and Okusangh B. Accuracy of Urine Dipsticks 2 hour and 12 hour Urine Collection for Protein Measurement as Compared with 24 hour Urine Collection. Journal of Obstetrics and Gynaecology. 2008 July; 28(5): 496-500. [DOI]
19. Arias F, Rodriquez L, Rayne SC, Kraus FT. Maternal placental vasculopathy and infection: two distinct subgroups among patients with preterm labor and preterm ruptured membranes. Am J Obstet Gynecol. 1993Feb;168(2):585-91. [DOI]
20. Rinehart BK, Terrone DA, Larmon JE, Perry KG Jr, Martin RW, Martin JM Jr. A 12 hour collection Accurately Assesses Proteinuria in Hospatilazed Hypertensive Gravida. J Perinatol, 1999;19:556-8. [DOI]
21. Tara F, Mansouri A, Ravanabakhsh F, Tahersima Z. Using 2-hour/ 6 hour Urine protein measurement as substitute diagnostic method for evaluation of preeclampsia. Int J Obstet Gynecol. 2008;10:1–7. [DOI]
22. Report of the National high Blood Pressure Education Program Working Groups on High Blood Pressure in Pregnancies. Am. J. Obstet Gynecol. 2000 Jul; 183(1):S1-S22 [PMID]
23. Sibai 2003. Adopted from Hyperensive Disorders in Pregnancy. Williams Obstetrics 2005; 22:766