

# Comparing the gold standard of 24-hour urinary albumin excretion with shorter collection period in pre-eclamptic women for evaluation of pre-eclampsia

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## Abstract

**Objectives:** To evaluate whether a 24-hr urine collection for measuring urinary albumin excretion in preeclamptic women can substitute 12-hr collection or spot urine samples. **Materials and Methods:** The present study was conducted in the Department of Obstetrics and Gynaecology SMGS Hospital, Government Medical College, Jammu for a period of one year from October 2013 to September 2014. It was a prospective study carried out on 100 preeclamptic patients having urine albumin at least 1+ using dipstick test. From each women one spot urine sample, two 12-h sample, and one 24-h urine were collected. Total collection time for 24 hour urine collection was started on the first morning after admission to the hospital and all samples were collected within a day. For each sample, urine albumin concentrations in milligram per litre were analyzed by colorimetric method. The data was presented as mean±SD. The correlation between one spot and two 12-hour and 24-hour urine samples was examined using Pearson correlation test. **Results:** Out of the enrolled 100 cases, mean age of the participants was 27.14 year (SD 4.477 years). The majority of patients were primigravida (69%). Mean systolic BP was 153.8 mm of Hg (SD 14.87mm of Hg) while mean diastolic BP was 102.46 mm of Hg (SD 9.82mm of Hg). Mean 24-h urinary albumin excretion was 734.35 mg/L (SD 687.860mg/L), mean spot urinary albumin excretion was 1063.66mg/L (SD 1009.340). Mean 12-h day urinary albumin excretion was 733.52 mg/L (SD 677.970 mg/L), mean 12-h night urinary albumin excretion was 752.67 mg/L (SD 803.56 mg/L). The differences between the 24-hour collection and the spot samples were too great to be acceptable in clinical practice. Albumin concentrations in a 12-h (day) and 12-h (night) interval collection fitted closely with the 24-h collection. **Conclusion:** The study concluded that the gold standard 24-h urinary assessment of albuminuria in preeclamptic women could be substituted with a 12-h collection.


**Keywords:** Pre-eclampsia, 24 hr urinary albumin, 12 hr urinary albumin, spot urinary sample.

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## INTRODUCTION

Preeclampsia is the most common hypertensive disorder complicating pregnancy. The global incidence of preeclampsia is reported to be 5%-14% of all the pregnancies (Lim KH *et al.*, 2013). In 2005, there were an estimated 536000 maternal deaths worldwide. Most of these deaths occurred in developing countries, and were avoidable (WHO 2005). Worldwide, preeclampsia and eclampsia are responsible for approximately 14% of all maternal deaths per year (Nisell H *et al.*, 2006). During pregnancy, proteinuria has traditionally been regarded as

a hallmark of preeclampsia and an indicator of its severity. Patient testing may improve if the test for proteinuria can be simplified or shortened since collecting urine over 24 hours is a cumbersome procedure for most subjects. The 24- hour urine collection is the gold standard diagnostic method for significant proteinuria in hospitals but it is usually considered difficult and sometimes leads to incomplete collection of urine (Gabbe SG *et al.*, 2007). In addition, it could delay the diagnosis. This delay in diagnosis of pre-eclampsia and its severity may result in unnecessary hospitalization and an economic burden for patients (Wongkitisophon K *et al.*, 2003). Hence, several studies have materialized in order to address this concern. Dipstick reagent strips are cheap, readily available, easy to administer and it detects most proteins in the urine especially albumin. Since urinary dipstick is a measure of protein concentration instead of its absolute value, factors such as patient’s hydration status, sample contamination with vaginal secretions and/or blood, infection, pH and specific gravity could contribute to the deviation of the result from the gold standard. For pregnant women the circadian variation in albumin excretion is absent and it may therefore be possible to use shorter collection periods (Douma CE *et al.*, 1995; Jaschevatzky OE *et al.*, 1990). Researchers have suggested faster methods for detection of proteinuria, such as using the protein-to-creatinine ratio, and random urinary samples, but these do not reveal the severity of pre-eclampsia as reliably as 24- hour urine collection (Jaschevatzky OE *et al.*, 1990).

The aim of this study is to evaluate whether a 24-hr urine collection for measuring urinary albumin

excretion in pre-eclamptic women can be substituted by a 12-hr collection or spot urine samples.

## MATERIAL AND METHODS

The study was conducted in the Department of Obstetrics and Gynaecology, SMGS Hospital ,Government Medical College, Jammu for a period of one year from October 2013 to September 2014

### Inclusion Criteria

Age 18-40, Blood pressure of >140mm systolic or diastolic >90mmHg. Positive urine for albumin of at least 1+ corresponding to an albumin excretion of 300 mg /L anda planned 24-h urine collection for quantitative albumin excretion.

### Exclusion Criteria

Known renal disease, Urinary tract infection, Spontaneous labour or need to induce labour within first 24 hour of admission.

From each women one spot urine sample, two 12-h sample, and one 24-h urine were collected. Urine collection was started on the first morning after admission to the hospital and all samples were collected within a day. For each sample, urine albumin concentrations in milligram per litre were analyzed by colorimetric method. The data was presented as mean±SD. The correlation between one spot and two12-hour and 24-hour urine samples was examined using Pearson correlation test. Data analysis was performed using Statistical Package for Social Sciences (SPSS, version 20), paired t test was used and a p-value of <0.05 was considered statistically significant.

## RESULTS AND DISCUSSION

**Table 1:** Age Distribution of Participants

Age (Years)	Number of Patients	Percentage (%age)
20-24	29	29
25-29	41	41
30-35	25	25
>35	5	5

**Table 2:** Systolic Blood Pressure of the Participants

Systolic BP (mm of Hg)	Number	Percentage(%age)
140-149	39	39
150-160	37	37
>160	24	24

**Table 3:** Diastolic Blood Pressure

Diastolic BP (mm of Hg)	Number	Percentage
90-99	27	27
100-110	65	65
>110	8	8

**Table 4:** Showing Comparison between 24-h urine albumin & spot sample

Variable	Mean ± SD mg/L	t value & p value
24-h sample	734.35 ± 687.860	t = 5.1, p=.0001
Spot sample	1063.66 ± 1009.340	

**Table 5:** Showing Comparison Between 24-h urine albumin & 12-h day sample

Variable	Mean ± SD mg/L	t value & p value
24-h sample	734.35 ± 687.860	t = .083, p=.0001
12-h day sample	733.52 ± 677.970	

**Table 6:** Showing Comparison Between 24-h urine albumin & 12-h night sample

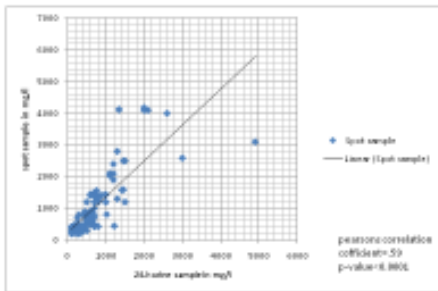
Variable	Mean ± SD mg/L	t value & p value
24-h sample	734.35 ± 687.860	t = -414, p=.0001
12-h night sample	752.67 ± 803.56	

**Table 7:** Showing Correlation Between other Samples with the 24-H Sample

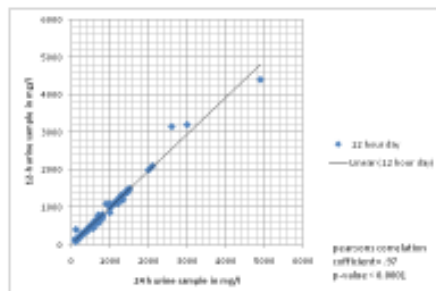
Groups vs Groups	Correlation Coefficient (r <sup>2</sup> )	p-value
Spot 24-H	.59	<0.0001
12-H day 24-H	.97	<0.0001
12-H night 24-H	.69	<0.0001

**Table 8:** Showing Multiple Comparisons of Urine Albumin Concentration

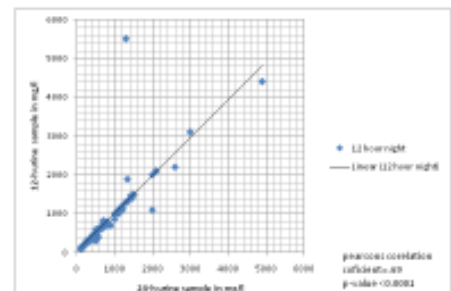
Groups vs Groups	Mean Difference	p-value
Spot 24-H	329.310	.0001
12-H day 24-H	.830	.934
12-H night 24-H	-18.320	.68



**Figure 1**



**Figure 2**



**Figure 3**

**Legend**

**Figure 1:** Showing Scatter Diagram Showing Comparison Between Spot Sample; **Figure 2:** Showing Scatter Diagram Showing Comparison Between 12-H day & 24-H Urine Sample; **Figure 3:** Showing Scatter Diagram Showing Comparison Between 12-H Night & 24-H Urine Sample

In the present study patients were in the range of 20-38 years, majority patients were in the age of 25-35years of age (Table 1) with mean age of 27.14year, which was consistent with the study by Rangasamy S *et al.*, 2012 and Kieler H *et al.*, 2003 . Sixty nine percent women were nulliparae and 31% were multiparae (Table 2)., the results were consistent with study by Kieler H *et al.*, 2003, who found 76.6% of patients to be nulliparae and 23.3% multipara . Nnumerous workers have demonstrated that primigravida are at higher risk of developing preeclampsia (Davey DA *et al.*, 1998; Akinkugbe A *et al.*, 1996; Onah HE *et al.*, 1996). Mean systolic BP of patients was 153.8 mm of Hg ( Table 3) and mean diastolic BP of patients was 102.04 mm of Hg

(Table 4) which is comparable with the studies of Rangasamy S *et al.*, 2012 , Kieler H *et al.*, 2003. The mean 24-h urinary albumin excretion was 734.35 mg/L (SD 687.860mg/L) (Table 5) which was not consistent with the studies done by Rangasamy S *et al.*, 2012 and Kieler H *et al.*, 2003 where the mean 24-h urinary albumin excretion was 95.7220 mg/L and 3.0 g/L respectively . In the present study mean spot urinary albumin excretion was 1063.66mg/L (SD 1009.340) .Correlation between 24-h and spot sample was significant (r<sup>2</sup>=.599,p=.0001) (Table 5 ,figure 1). The mean difference between spot sample and 24-h sample was 321.310 mg/l (SD 645.679mg/l) which was significant. This study was consistent with study of Kieler

H *et al.*, 2003. The differences between the 24-hour collection and the spot samples were too great to be acceptable in clinical practice, but this study was not consistent with of Rangasamy S *et al.*, 2012 . In the present study, the pre-eclamptic women who had significant albuminuria were found to have a good correlation between urinary albumin concentrations measured in samples collected for 12 h (day and night samples) and the gold standard 24 h. In our study, mean 12-h day urinary albumin excretion was 733.52 mg/L (SD 677.970 mg/L). Correlation between 24-h and 12-h day sample is significant ( $r^2=.978$ ,  $p=.0001$ ). The mean difference between 12-h day sample and 24-h sample is .830 mg/l (SD 100.131 mg/l) which is insignificant ( $p=.934$ ) (Table 6 ,figure 2) . Hence 12-h day sample relates significantly with 24-h sample and there is insignificant difference between the two. The mean difference between the 12 night and 24-h sample was  $-18.320$  (insignificant .680). Correlation between 24-h and 12-h night sample is significant ( $r^2=.697$ ,  $p=.0001$ ). The mean difference between 12-h day sample and 24-h sample is 18.320mg/l (SD 442.958 mg/l) which is insignificant ( $p=.680$ ) (Table 7,figure 3). Hence 12-h night sample relates significantly with 24-h sample and there is insignificant difference between the two. In our study, the preeclampsia women who had significant albuminuria were found to have a good correlation between urinary albumin concentrations measured in samples collected for 12 h (day and night) and the gold standard 24-h collection. In this study in women with preeclampsia who had significant albuminuria, we found good agreement between urinary albumin concentrations measured in samples collected for 12 hours and the traditional 24-hour collections. Our study results are consistent with (Rinehart BK *et al.*, 1999; Kielera H *et al.*, 2003; Rangasamy S *et al.*, 2012). Several studies like (Evans W *et al.*, 2000; Adelberg AM *et al.*, 2001; Kalilian S *et al.*, 2001; Somanathan N *et al.*, 2003; Wongkitisophon K *et al.*, 2003; Moslemizadeh M *et al.*, 2005; Soghra R *et al.*, 2007; Abebe J *et al.*, 2008; Otero pinto J *et al.*, 2009; Afsane A *et al.*, 2011) have been done for evaluation of proteinuria in a shorter duration of time (2, 4, 6, 8 or 12 h) and all of them revealed that it is possible to determine proteinuria and its severity in a shorter timed urine collections. Rinehart BK *et al.*, 1999 suggested that the sensitivity and specificity of the 12 h urine collection was 96% and 100%, respectively and concluded that a 12 h urine collection accurately depicts the amount of proteinuria in hospitalized gravidas being evaluated for preeclampsia.

## CONCLUSION

The study concluded that the gold standard 24-h urinary assessment of albuminuria in preeclamptic women could be substituted with a 12-h collection. The association of the 24-h collection and the spot samples was weaker as compared to the 12-h collection.

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