ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
Index Copernicus Value: 68 . 16
PubMed - National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 5, Issue –3, June - 2020, Page No. : 384 - 389

To assess spot urinary albumin-creatinine ratio in pregnant women

[1]Dr. B S Meena, Senior professor & HOD, Department of Obstetrics and Gynaecology, SMS Medical College, Jaipur, Raj.

[2]Dr. Gayatri Mahawar, Resident Doctor, Department of Obstetrics and Gynaecology, SMS Medical College, Jaipur, Raj.

Corresponding Author: Dr. Gayatri Mahawar, Resident Doctor, Department of Obstetrics and Gynaecology, SMS Medical College, Jaipur, Raj.

Citation this Article: Dr. B S Meena, Dr. Gayatri Mahawar, "To assess spot urinary albumin-creatinine ratio in pregnant women **"**, IJMSIR- June - 2020, Vol – 5, Issue -3, P. No. 384 – 389.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: As creatinine excretion is fixed and albumin concentration in urine varies with hydration status, the random(spot) urine albumin creatinine ratio(ACR ratio) nullifies the effect of hydration on protein estimation and gives physiologically more relevant information than 24 hour excretion method.

Methods: A hospital based prospective study done on 625 women who attended the department of Obstetrics and Gynaecology, SMS Medical College, Jaipur from routine antenatal case, over a period of 1 year (june 2018 to may 2019) between 17-20 week of gestation were included in the study after obtaining informed consent.

Results: In our study mean ACR level in 18-28 Yrs age group women was 13.12±6.21 and in 29-38 Yrs age group women was 12.35±3.79. Mean ACR level in middle socio-economic status group women was 12.97±5.72 and women belonging to lower socio-economic status group was 12.96±5.94 in our study

Conclusion- It appears that ACR could be very useful test in near future not only for predicting the development of preeclampsia, but it also its severity and fetomaternal outcome. However additional studies and cost benefit analysis are required to confirm these findings before recommending this test for screening purposes.

Keywords: ACR, Pregnant female, Urine.

Introduction

Hypertension is the most common medical risk factor encountered during pregnancy.[1] Gestational hypertension is defined as a systolic blood pressure level of 140 mm hg or higher that occurs after 20 weeks of gestation in a women with previously normal blood pressure. A medical condition characterized by hypertension and significant amounts of protein in urine of a pregnant woman is referred to as preeclampsia. [1] The incidence of preeclampsia in pregnant women is 5-7% .[2]

Proteinuria is an important sign of preeclampsia, and diagnosis is questionable in its absence. It develops late in the course of the disease. As proteinuria increases, the likelihood of complications also increase, hence a rapid and accurate detection and quantification of

proteinuria is essential for the management of hypertensive pregnant women.

Studies have shown that urinary dipstick is a poor predictor of the 24-hour urine total protein level[2-3] Compared with a qualitative dipstick result, a quantitative analysis of a random urine sample is necessary. As creatinine excretion is fixed and albumin concentration in urine varies with hydration status, the random(spot) urine albumin creatinine ratio(ACR ratio) nullifies the effect of hydration on protein estimation and gives physiologically more relevant information than 24 hour excretion method. Random urine sample collection is simple procedure and can be done at any time of the day,though few studies recommend morning samples.[4]Early diagnosis of preeclampsia with a albumin and creatinine ratio would be a valuable diagnostic tool with good accuracy when albumin creatinine ratio>0.3 The ratio of albumin to creatinine in a random "spot" urine can provide a rough estimate of protein excretion;for example, an albumin/creatinine ratio of 3.0 correlates to ~3.0g of proteinuria per day.It could prevent unnecessary hospitalization, testing, and lead to earlier diagnosis. Several authors have studied the relationship between the albumin/creatinine ratio and it has been found it to be superior diagnostic tool compared to routine urine analysis.[4-5]

Material & Methods

Study Population: A hospital based prospective study done on 625 women who attended the department of Obstetrics and Gynaecology, SMS Medical College, Jaipur from routine antenatal case, over a period of 1 year (june 2018 to may 2019) between 17-20 week of gestation were included in the study after obtaining informed consent.

Inclusion Criteria

- Singleton pregnancy
- Gestational age between 17-20 wks by last menstrual period verified by USG.
- Urine sample provided at gestational age 17-20 wks.
- Normal renal function and no evident proteinuria upon measurement with dipstick.

Exclusion Criteria

- Multi-fetal pregnancy
- Women with hematuria, dipstick-positive proteinuria, ongoing urinary tract infection, acute renal failure on chronic kidney disease.
- Mental retardation or other mental disorder that doubts regarding the subject's true willingness to participate in study.
- Gestational age below 17 and above 20 wks by last menstrual period verified by USG.
- Lack of urine sample at the specified enrollment period.
- Known major fetal anomaly and fetal demise.
- Lack of demographic data.

Methods

All pregnant women of 17 to 20 week of Gestation attending Antenatal Department at SMS Medical College, Jaipur were selected according to inclusion and exclusion criteria as per sample size after written & informed consent.

Detailed History, General and systemic examination and routine blood investigations were carried out.

Urine sample irrespective of time was collected. Urine was tested for albumin and creatinine. Value of albumin to creatinine ratio was found out. Then at each visit subjects, were evaluated by eliciting history for symptom of preeclampsia and imminent eclampsia such as oedema, vomiting, epigastric pain, decreased urinary

output and visual disturbance. Blood pressure was measured. The patients were followed up till delivery and association between albumin and creatinine ratio (ACR) and preeclampsia was found out.

A mid stream clean catch spot urine sample was collected for estimation of albumin and creatinine.

Albumin was determined by Immunoturbidimetric method and creatinine estimated by Jaffes's method.

Estimation of Urinary Albumin

It was measured in spot urine sample by micro albumin turbidimetric procedure using micro albumin reagent and Beckman coulter AU analyzer. Results automatically printed out for each sample in mg/dl at 37 degree Celsius.

During operation of the Beckman coulter AU analyzer at least two levels of an appropriate quality control material of human origin only should be tested a minimum of once a day.

Expected Values

Urine	24-h collection (mg/24h)	Timed collection (µg/min)	Spot collection (µg/mg creatinine)
Normal	<30	<20	<30
Microalbuminuria	30-299	20-199	30-299
Clinical Albuminuria	≥300	≥200	≥300

Estimation of Urinary Creatinine

Urine creatinine was measured in spot urine sample by Modified Jaffe's reaction using Erba reagent kit at fully automated Beckman Coulter AU680. Urine was diluted 1/20 with distilled water and results were multiplied by 20. Daily control was run at auto analyzer.

Calculation

The creatinine value of the unknown is determined by comparing its absorbance change with that of a known standard.

$$\frac{Mg}{dl} = \frac{\Delta Abs(Unknown)}{\Delta Abs(Standard)(mg/dl)} x Concentration of Std.$$

Mg/dl = ΔAbs(Unknow) x Concentration of Std.

ΔAbs(Standard)(mg/dl)

Where: ΔAbs =Absorbance change between reading(A2-A1)

Estimation of Urinary Albumin Creatinine Ratio

Urine albumin was analyzed in mg/dl and urine creatinine was also analyzed in mg/dl in spot urine sample, urinary ACR was analyzed by simply dividing the urine albumin (mg/dl) by urine creatinine (mg/dl).

Urinary ACR = Urine Albumin / Urine Creatinine

Statistical Method

Comparison of spot urinary albumin creatinine ratio and birthweight between unaffected and affected groups was performed by Kruskal–Wallis test. ANOVA and Chi-square test were used for comparison of continuous and categorical data between the groups. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) at different values of urinary albumin creatinine ratio were calculated using receiver operating curve (ROC).

Results

Table 1: Distribution of cases according to Age

Age	Total (n=625)	ACR levels		P value
		Mean	SD	
18-28 yrs	495	13.12	6.21	0.175
29-38 yrs	130	12.35	3.79	

Total	625			

In present study mean ACR level in 18-28 Yrs age group women was 13.12±6.21 and 29-38 Yrs age group women was 12.35±3.79. The difference was found statistically Insignificant (P value = 0.175).

Table 2: Distribution of cases according to Socio economic status according to modified B.J. Prasad classification

Socio-economic status	Total (n=625)	ACR levels		P value
		Mean	SD	
Middle	403	12.97	5.72	0.983
Lower	222	12.96	5.94	

In the present study mean ACR level in middle socio-economic status group women was 12.97±5.72 and women of lower socio-economic status group were 12.96±5.94. The difference was found statistically Insignificant (P value=0.983).

Table 3: Distribution of cases according to Gestational Age (weeks)

Gestational Age (Weeks)	Total (n=625)	ACR levels		P value
		Mean	SD	
17	171	13.33	6.55	0.762 (NS)
18	227	12.76	5.14	
19	113	12.73	5.53	
20	114	13.04	6.14	

In present study mean ACR level in women with 17 weeks gestational age was 13.33±6.55, women with 18 weeks gestational age was 12.76±5.14, women with 19 weeks gestational age was 12.73±5.33 and women with 20 weeks gestational age was 13.04±6.14. The difference was found statistically Insignificant (P-value = 0.762).

Table 4: Distribution of cases according to Gravida

Gravida	Total (n=625)	ACR levels		P value
		Mean	SD	
G1	208	12.75	5.13	P<0.001
G2	188	13.68	7.25	
G3	141	12.39	3.85	
G4	71	12.71	6.10	
G5	13	13.88	8.34	
G6	2	10.63	0.29	
G7	1	12.92	0.0	
G8	1	12.35	0.0	

In the present study mean ACR level in women with the first gravida was 12.75±5.13, women with second gravid was 13.68 ±7.25, women with the third gravida was 12.39±3.85 and women with the fourth gravida was 12.71±6.10. The difference was found statistically significant (P<0.001).

Table 5: Distribution of cases according to Parity

Parity	Total (n=625)	ACR levels		P value
		Mean	SD	
P0	248	12.72	5.09	0.259
P1	206	13.68	7.47	
P2	124	12.49	4.05	

P3	40	12.50	4.82	
P4	7	11.24	1.14	

In the present study mean ACR level in women with Zero/null parity was 12.72±5.09, women with one parity was 13.68 ±7.47, women with second parity was 12.49±4.05 and women with third parity was 12.50±4.82. The difference was found statistically Insignificant (P-value = 0.259).

Discussion

Hypertensive disorders in pregnancy stand out to be one of the leading causes of maternal and neonatal morbidity and mortality. Timely and effective intervention has utmost importance in the prevention of these complications. Proteinuria has been an important constituent of preeclampsia.

Preeclampsia remains a leading cause of maternal and fetal morbidity and mortality. Studies have shown that alteration in the regulation and signaling of angiogenic pathway contributes to the inadequate cytotrophoblast invasion, resulting in preeclampsia. Endothelial dysfunction has been demonstrated as early as 22 weeks of gestation, and levels of antiangiogenic factors start rising as early as 17 weeks of gestation. It could be expected that microalbuminuria, a marker of endothelial dysfunction, might also be apparent by this time.[5]

In the present study mean ACR level in 18-28 year age group women was 13.12±6.21 and 29-38 year age group women was 12.35±3.79. This age shows that women between 18-28 year have high ACR. Mean age in our study is 18-28 year. In Mishra VV.[6] study mean age was 27.79±4.79 year, in Baweja S.[7] study it was 26.3±4.9 year, in Singh H. et al[5] study it was 35 year. Which is different in our study due to larger range of age group taken in column and only two columns were made.

In present study according to B.J. Prasad classification subjects were divided into middle socioeconomic or lower socioeconomic class. Middle socioeconomic class had (403) with mean ACR 12.97±5.72 and lower socioeconomic class (222) with mean ACR 12.96±5.92 Middle socioeconomic class subjects were more in our study. In Taslima B. et al[8] study subjects were mostly middle socioeconomic class .

Conclusion

It appears that ACR could be very useful test in near future not only for predicting the development of preeclampsia, but it also its severity and fetomaternal outcome. However additional studies and cost benefit analysis are required to confirm these findings before recommending this test for screening purposes.

References

1. Cunningham FG, Leveno KJ, Bloom SL, Spongy CY, Dashe JS, Hoffman BL, Casey BM, Sheffiled JS, Hypertensive Disorders, Williams Obstetrics, 24th ed. McGraw Hill Education 2014; 65.
2. Kuo VS, Koumantakis G, Gallery ED, Proteinuria and its assessment in normal and hypertensive pregnancy, American Journal of Obstetrics and Gynecology, 1992; 167 : 723-8.
3. Devi T, Nimonkar AR. Spot urinary albumin creatinine ratio as a predictor of preeclampsia and dilemma in clinical interpretation. International Journal of Reproduction, Contraception, Obstetrics and Gynecology 2018;7:4086-92.
4. Newman DJ, Pugia MJ, Lott JA, Wallace JF, Hiar AM. Urinary protein and albumin excretion corrected by creatinine and specific gravity. Clinica Chimica Acta. 2000; 294 : 139-55.

5. Townsend R, O'Brien P, Khalil A. Current best practice in the management of hypertensive disorders in pregnancy. Integrated Blood Press Control. 2016;9:79–94.
6. Mishra VV et al "Evaluation of Spot Urinary Albumin-Creatinine Ratio as Screening tool in prediction of Pre-eclampsia in early Pregancy "Indian Journal of Obstetrics and Gynaecology 2017; 67(6) : 405-408.
7. Baweja S, Kent A, Masterson R, et al. Prediction of pre-eclampsia in early pregnancy by estimating the spot urinary albumin: creatinine ratio using high-performance liquid chromatography. British Journal of Obstetrics and Gynecology. 2011;118(9):1126–1132.
8. Taslima B, Ali KMS, Khanam S, Habib MA,"Clinico-Demographic and Urinary Albumin in prediction of preeclampsia among pregnant women at a tertiary care hospital", Journal of Science Foundation,2018;16(2):54-59.