

Effectiveness Of Urine Dipstick In Diagnosis Of Pre-eclampsia

Ferhat Uzair, Urooj Naz, Samia Shuja, Abdul Waheed, Tahira Assad

ABSTRACT

Objective: To determine the efficacy of urine dipstick in Pre-eclampsia.

Study Design and Setting: This was a cross-sectional study conducted at the department of obstetrics & gynecology of a tertiary care hospital from May-2017 to September-2018.

Methods: All the pregnant women of age 15-45 years, BP=140/90 mmHg on two occasions 4 hours apart or single diastolic value of 100 mmHg, gestational age >20 weeks, singleton pregnancy, booked in first trimester of pregnancy were included in the study. Statistical package SPSS 22 was used for the analysis of data chi-square tests were applied for the diagnostic accuracy of urine dipstick in detection of Pre-eclampsia in pregnant women. P-value was <0.05 was considered as significant.

Results: Total 211 pregnant women were enrolled in the study. Mean (SD) age was 28.26(3.86) years. Overall sensitivity and specificity of urine dipstick was found to be 94% and 95.4% respectively, positive predictive value 95%, negative predictive value 94.5% and excellent diagnostic accuracy 94.7% of urine dipstick was observed for the diagnosis of spot urine protein creatinine ratio

CONCLUSION: Urine dipstick found to be sensitive and reliable test to screen pre-eclampsia

Key words: Diagnostic accuracy, Pre-eclampsia, Sensitivity, Specificity, Spot urine protein creatinine ratio, Urine dipstick

INTRODUCTION:

Pre-eclampsia is a common hypertensive disorder of pregnancy and it affects around 3-14% of all pregnant women worldwide.¹ In most of the developing countries around 40,000 pregnant women die each year due to pre-eclampsia.^{1,2} In developing countries, it is estimated that about 40-60% of maternal death occur due to pre-eclampsia. Pre-eclampsia is the illness that arises only during pregnancy.³ It occurs most commonly in women having their first pregnancy. A woman who had pre-eclampsia during first pregnancy has 25-50% chances of developing it again in later pregnancies.^{4,5} Women at extremes of age such as teenagers and women over 40 have higher risk of developing this condition.^{4,5}

However, the statistics from Pakistan are limited. In Pakistan the incidence of pre-eclampsia is 7%. Pre-eclampsia is rated as the 3rd leading source of death related to pregnancy, after hemorrhage and embolism.⁶

Roberts CL et al (2011) showed that the rates of pregnancy hypertension and pre-eclampsia declined over time in most of the population of northern Europe and Australia from 1997 to 2007 (3.6% to 9.1% and 1.4% to 4.0% respectively).⁷

In 2014, a systemic review done by World Health Organization (WHO) on global causes of maternal death reported that hypertensive disorders accounted for 14% of maternal deaths worldwide. In developed regions it accounted for 12.9%, 14% in developing regions, 16.9% in Northern Africa, 16% in Sub-Saharan Africa, 10.4% in Eastern Asia, 10.3% Southern Asia, 14.5% in Southeastern Asia, 13.4% Western Asia, 14.7% in Caucasus and Central Asia, 22.1% in Latin America and Caribbean and 13.8% in Oceania.⁸

Urine dipstick is a rapid, inexpensive and easy to use tool. However the results of dipstick provide low sensitivity and specificity for urine protein excretion over 24 hours⁹. Urine collection over 24 hours is considered the traditional comparator for quantification of proteinuria in pregnancy, when significant proteinuria is defined as 0.3 g/day or more.¹⁰ This is the traditional technique and considered as Gold standard, but it has many disadvantages. It is time-consuming and expensive.¹¹

In Pakistan, urine dipstick for all cases of suspected pre-eclampsia is practiced due to quickest and cheapest method of assessing proteinuria. But previous studies showed a wide range of sensitivity and specificity. There is a wide variation

Ferhat Uzair
Senior Registrar
Albishri Medical Complex, Rabigh.

Urooj Naz
Senior Registrar
Dow University of Health Sciences, Karachi.

Samia Shuja
Head of the department Gynaecology and Obstetrics
Indus Hospital, Karachi.

Abdul Waheed
Assistant Professor and Head of Department
Forensic Medicine and Toxicology
Karachi Institute of Medical Sciences, Malir Cantt.
Email: chundrigarwaheed@yahoo.com

Tahira Assad
Associate Professor, Pharmacology Department
Karachi Institute of Medical Sciences, Malir Cantt

Received: 21-05-2019
Accepted: 15-11-2019

in the results of different studies. There is much need to determine its effectiveness in determining proteinuria in diagnosis of pre-eclampsia as the cost of 24 hours urine protein test is much higher as compared to spot urinary protein to creatinine ratio. Present study was specifically designed to evaluate the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of urine dipstick in Pre-eclamplasia.

METHODOLOGY:

This was a cross-sectional study conducted at the department of obstetrics & gynecology of a tertiary care hospital from May-2017 to September-2018. According to diagnostics accuracy sample size calculator by taking sensitivity of urine dipstick 80%, specificity 95%, margin of error for sensitivity i.e (d) 16%, for specificity 3%, confidence interval 95%, level of significance 5%, then the estimated sample size was (n= 211) selected women were advised to collect midstream urine. Dipstick test was performed and same sample were sent to laboratory for urine protein creatinine ratio. Finding on Urine dipstick if proteinuria of > 300 mg and significant proteinuria is > 0.3 is considered positive in pre-eclampsia . The procedure was considered to be true positive (TP) when UPr/Cr ratio is > 0.3 mg/dl, urine dipstick is >300 mg. True negative were categorized with cut off when UPr/Cr ratio is <0.3 mg/dl, urine dipstick is <300 mg. Those female patients with history of renal diseases, hepatic diseases, diabetes, endocrine diseases, autoimmune diseases, illicit drug use or by any other medical illness were excluded. Patients with LMP not known and no dating scan available were also not considered. Data feeding and analysis were on SPSS version 22. Mean and standard deviation were calculated. Age, parity, gestational age, frequencies and percentages were calculated for finding of urine dipstick and protein creatinine ratio. A 2x2 tables was constructed to calculate sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of urine dipstick. Chi-square test was applied. P value < 0.05 was considered as significant.

RESULTS:

Total 211 pregnant women were enrolled in the study. Mean (SD) age was 28.26(3.86) years and mean (SD) gestational age was 27.18(3.61) weeks. Average height and weight was 60.01 inches and 75.84 kg respectively. Mean (SD) gravida and parity was 2.14(1.01) and 3.04(1.77) respectively. Mean (SD) SBP and DBP was 156.85(7.06) and 96.53(3.50) mmHg respectively. When the age was distributed by three interval from 15 years to 25years, it was observed that smallest age group was between 36-45 years (12%) and included twenty five 25 women. The group having largest number of women was between 26-35 years (58%) and included 122 women. Almost 121(57%) women had gestational age between 26-35 weeks. Out of 211 patients, 100(47.4%) women were recorded positive on the basis of urinary dipstick ratio>300

mg and 101(47.8%) on spot urine creatinine ratio having cut-off >0.3 mg/dl respectively.

Overall sensitivity and specificity of urine dipstick was found to be 94% and 95.4% respectively, positive predictive value 95%, negative predictive value 94.5% and overall diagnostic accuracy was 94.7%.

DISCUSSION:

Pre-eclampsia the most common hypertensive disorder victimizing 3-14% women worldwide.^{12,13} There are several methods for diagnosing pre-eclampsia^{14,15}. One of the widely used methods is urine dipstick. The advantage of the dipstick

Table 1: Descriptive and demographic characteristics

VARIABLE	Mean	Standard Deviation	Min-Max
Age (Years)	28.26	±3.86	24-41
Gestational Age (Weeks)	27.18	±3.61	22-36
Height (Inches)	60.01	±3.74	54-66
Weight (Kg)	75.84	±19.08	38-110
Gravida	2.14	±1.01	0-4
Parity	3.04	±1.77	1-7
SBP (mmHg)	156.85	±7.16	145-169
DBP (mmHg)	96.53	±3.50	92-103
Urine Dipstick ratio			
<300(mg)	111(52.6%)		
>300(mg)	100(47.4%)		
Spot urine creatinine ratio			
<0.3(mg/dl)	110(52.2%)		
>0.3(mg/dl)	101(47.8%)		
Maternal Age			
15-25 years	64(30%)		
26-35 years	122(58%)		
36-45 years	25(12%)		
Gestational Age			
<25 Weeks	71(34%)		
26-35 Weeks	121(57%)		
>35 Weeks	19(9%)		

Table 2: Effectiveness of urine dipstick in detection of preeclampsia

Dipstick Ratio	Spot urine protein creatinine ratio		Total
	>0.3 mg/dl	<0.3 mg/dl	
>300	95(TP)	5(FP)	100(47.40%)
<300	6(FN)	105(TN)	111(52.6%)
Total	101(47.8%)	110(52.2%)	211(100%)

Sensitivity = $(95 \div 101) \times 100 = 94.0\%$,
 Specificity = $(105 \div 110) \times 100 = 95.4\%$
 Positive predictive value = $(95 \div 100) \times 100 = 95\%$,
 Negative predictive value = $(105 \div 111) \times 100 = 94.5\%$
 Diagnostic Accuracy = $(95+105) \div 211=94.7\%$,
 P-value<0.001*

Table 3 Diagnostic accuracy of Urine Dipstick with age and gestational age

Age groups	Sensitivity	Specificity	PPV	NPV	Accuracy
Age< or =30 Years	82.80%	83.30%	85.20%	80.60%	83%
Age>30 Years	80.60%	86%	78.1%	87.7%	83.90%
Gestational Age					
Gestation period<or =28 Weeks	84%	93.30%	93.30%	85.70%	88.40%
Gestation period >28 Weeks	49.00%	66.10%	45.40%	70.40%	58.60%

test is that it can be done anywhere by any trained paramedical or medical personnel while the urinary protein/creatinine ratio, require laboratories and trained laboratory personnel. But the diagnostic accuracy of urine dipstick for the diagnosis of pre-eclampsia is debatable.^{16,17}

There are several studies who recommended urine dipstick but many studies found other methods more reliable than urine dipstick. Eigbefoh (2006)⁹, Archanakumari et-al (2013)¹⁶, Park(2013)¹⁸, Kumari(2013)¹⁶ and Jan, S., et al. (2017)¹⁹ have showed that urine dipstick is unreliable and poorly correlates with quantitative urine protein determinations. They recommended using protein creatinine ratio. On the other hand Zibaenezhad, M. J., et al²⁰, Uzan, J.²¹ and Morris, R., et al. (2012)²² showed good diagnostic accuracy of urine dipstick.

Zibaenezhad, M. J., et al. (2010)²⁰ showed that the sensitivity, specificity, positive and negative predictive value of urine dipstick was 80%, 95%, 22.2% and 99.6% respectively. Whereas, Nischintha, S., et al. (2014) reported sensitivity 74% and specificity 89% another study by Chotayapom (2011)^{23,24} reported sensitivity 56% to 80% and specificity 67% to 92% respectively.

In this study, urine dipstick is found to be a reliable method with overall sensitivity of 94%, specificity of 95.4%, positive predictive value 95%, negative predictive value 94.5% and diagnostic accuracy of 94.7%. Urine dipstick was found to be reliable and have good diagnostic accuracy in age groups =30 and >30. According to gestational age, urine dipstick had very low diagnostic accuracy for gestational age >28 weeks whereas, good diagnostic accuracy was observed for gestational age =28 weeks.

Our study has added an evidence to the literature that urine dipstick is reliable in detecting pre-eclampsia in pregnant women with high sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy.

Conclusion: Urine dipstick found to be sensitive and reliable test to screen pre-eclampsia.

REFERENCES:

1. Lakew Y, Reda AA, Tamene H, Benedict S, Deribe K. Geographical variation and factors influencing modern contraceptive use among married women in Ethiopia: evidence from a national population based survey. *Reprod Health.* 2013;10(1):52.

2. Moodley J. Maternal Deaths Associated with Hypertensive Disorders of Pregnancy: a opulation-Based Study. *Hypertension in pregnancy.* 2004;23(3):247-56.
3. Pre-eclampsia : Toxemia American Pregnancy Association2012 [updated Jan-2012; cited 2014 19-Aug-2014]; Available from: <http://americanpregnancy.org/pregnancycomplications/pre-eclampsia.html>.
4. Carlson KJ, Eisenstat SA, Ziporyn TD. The new Harvard guide to women's health. Harvard University Press; 2004. p. 482-3.
5. Clinic M. The incidence of pre-eclampsia. HEDU Africa [updated 2014; cited 2014 20-Aug-2014]; Available from: <http://www.hedu-africa.org/message/entry/the-incidence-of-pre-eclampsia-worldwide-varies-between-2-10-and-the-WHO>.
6. Ayaz A, Muhammad T, Hussain SA, Habib S. Neonatal outcome in pre-eclamptic patients. *J Ayub Med Coll Abbottabad.* 2009;21(2):53-5.
7. Roberts CL, Ford JB, Algert CS, Antonsen S, Chalmers J, Cnattingius S, et al. Population-based trends in pregnancy hypertension and pre-eclampsia: an international comparative study. *BMJ open.*2011;1(1).
8. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller A-B, Daniels J, et al. Global causes of maternal death: a WHO systematic analysis. *The Lancet Global Health.* 2014;2(6):e323-e33.
9. Eigbefoh J, Abebe J, Odike M, Isabu P. Protein/creatinine ratio in random urine specimens for quantitation of proteinuria in pre-eclampsia. *Int J Obstet Gynecol.* 2007;8.
10. Huang Q, Gao Y, Yu Y, Wang W, Wang S, Zhong M. Urinary spot albumin: creatinine ratio for documenting proteinuria in women with pre-eclampsia. *Reviews in Obstetrics and Gynecology.* 2012;5(1):9.
11. Côté A-M, Firoz T, Mattman A, Lam EM, von Dadelszen P, Magee LA. The 24-hour urine collection: gold standard or historical practice? *Am J Obstet Gynecol.* 2008;199(6):625. e1-. e6.
12. Osungbade KO, Ige OK. Public health perspectives of pre-eclampsia in developing countries: implication for health system strengthening. *J Pregnancy.* 2011;2011.
13. Steegers EA, Von Dadelszen P, Duvekot JJ, Pijnenborg R. Pre-eclampsia. *Lancet.* 2010;376(9741):631-44.
14. Salam RA, Das JK, Ali A, Bhaumik S, Lassi ZS. Diagnosis and management of pre-eclampsia in community settings in low and middle-income countries. *Journal of family medicine and primary care.* 2015;4(4):501.
15. Duhig KE, Shennan AH. Recent advances in the diagnosis and management of pre-eclampsia. *F1000prime reports.* 2015;7.

16. Kumari A, Singh A, Singh R. Evaluation of rapid diagnostic methods of urinary protein estimation in patients of pre-eclampsia of advanced gestational age. *Journal of obstetrics and gynaecology of India*. 2013;63(5):306-10.
17. Abebe J, Eigbefoh J, Isabu P, Okogbenin S, Eifediyi R, Okusanya B. Accuracy of urine dipsticks, 2-h and 12-h urine collections for protein measurement as compared with the 24-h collection. *J Obstet Gynaecol*. 2008;28(5):496-500.
18. Park J-H, Chung D, Cho H-Y, Kim Y-H, Son G-H, Park Y-W, et al. Random urine protein/creatinine ratio readily predicts proteinuria in pre-eclampsia. *Obstet Gynecol Sci*. 2013;56(1):8-14.
19. Jan S, Javaid C, Firdous N. Diagnostic accuracy of spot urinary protein/creatinine ratio for proteinuria in pregnancy induced hypertension. *Int J Reprod Contracept Obstet Gynecol*. 2017;6(5):2083-9.
20. Zibaenezhad MJ, Ghodsi M, Arab P, Gholzom N. The prevalence of hypertensive disorders of pregnancy in Shiraz, Southern Iran. 2010;4:169-72
21. Uzan J, Carbonnel M, Piconne O, Asmar R, Ayoubi J-M. Pre-eclampsia: pathophysiology, diagnosis, and management. *Vascular health and risk management*. 2011;7:467.
22. Morris R, Riley R, Doug M, Deeks J, Kilby M. Diagnostic accuracy of spot urinary protein and albumin to creatinine ratios for detection of significant proteinuria or adverse pregnancy outcome in patients with suspected pre-eclampsia: systematic review and meta-analysis. *BMJ*. 2012;345:e4342.
23. Nischintha S, Pallavee P, Ghose S. Correlation between 24-h urine protein, spot urine protein/creatinine ratio, and serum uric acid and their association with fetomaternal outcomes in preeclamptic women. *J Nat Sc Biol Med*. 2014;5(2):255.
24. Chotayaporn T, Kasitanon N, Sukitawut W, Louthrenoo W. Comparison of proteinuria determination by urine dipstick, spot urine protein creatinine index, and urine protein 24 hours in lupus patients. *J Clin Rheumatol*. 2011;17(3):124-9.

