A Correlative Study On The Spot Urine Protein Creatinine Ratio With 24 Hour Urinary Protein In Type 2 Diabetes Mellitus Patients In Father Muller Medical College

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I.   INTRODUCTION

The amount of protein excreted in the urine has diagnostic and prognostic importance in assessing diabetic kidney disease .The most common and gold standard method of quantifying urinary protein relies on 24 hour urine collections .It has been recognised that the amount of protein excreted can fluctuate significantly from day to day and that the errors like incomplete collection , bacterial growth , incomplete bladder emptying and incorrect timings would make it a cumbersome procedure.

As the urinary creatinine excretion in the presence of a stable glomerular filtration rate is fairly constant in a given patient , protein excretion rate were likewise stable during the day and that a simple ratio of the concentration of urinary protein and creatinine in a single voided urine sample would reflect the cumulative protein excretion over a day .

So the measurement of protein and creatinine ratio in a single voided urine sample can provide information that for clinical purposes is a satisfactory substitute for the determination of protein excretion in 24 hour urine collection.

II.   SUBJECTS AND METHODS

This is a prospective study done in a tertiary care hospital from January 2015 to February 2015 .The indoor patients of hospital who were advised 24 hour urine protein estimation above the age of 18 years were included in the study.A group of 40 volunteers with no risk factors for renal impairment on history and physical examination were taken in the study.Patients with urinary tract infection and excretion of abnormal amounts of leukocytes in urine were not included in the study. Haematuria and excretion of abnormal amount of RBc's in urine were also excluded .

The 24 hour urine sample was collected from 8 am on first day excluding the first morning urine sample, completing on the second day 8 am including the first morning urine sample . The random urine sample was taken either before or after completing the 24 hour urine collection .Urine protein analysis was done by sulphosalicylic acid method and creatinine estimation was done by modifies jaffe's method.The statistical test used for correlation was pearson's correlation . Chi square test was used to determine any association of risk factors to proteinuria .

III.   RESULTS

Of the 40 cases 14(36.1%) were females and 26(63.9%) were males. In 40 patients, 21(51.44%) had protein $\leq$ 0.15 g in 24 hours which was within the normal range and 19 (48.56%) had proteinuria more than 0.15 g (macro) which was in pathologic range. All normal volunteers had urine proteins in the normal range.

No significant correlation was found between gender of the subjects and proteinuria. The p value 0.185 (>0.05) was not significant.

The mean protein excretion in g/24 hour of cases was found to be 0.8207 g ($\pm$1.3364)

The mean UP/C ratio of cases was 0.7155 ($\pm$1.1151)

The UP/C ratio showed excellent correlation with the 24 hour urine protein values, $p < 0.05$ and correlation coefficient (r) of 0.98.

Area under the curve of ROC analysis in Table 2 represents accuracy of the test: a value close to 1 indicates a good test.

The regression coefficient in Figure 1 is 0.94, $p < 0.05$. The formula connecting UP/C ratio (y) to 24 hr urine protein (x) is y = 1.005x + 0.078.

MEAN AND STANDARD DEVIATION OF PROTEIN EXCRETION IN g/24 HOUR AND IN UP/C RATIO

GROUP	NUMBER	MEAN IN g/24 HOUR	STANDARD DEVIATION	MEAN IN UP/C RATIO	STD. DEVIATION
CASES	40	0.8207	1.3364	0.7155	1.1551

ROC Data for ROC Data for 40 Cases at Proteinuria >150 mg/24 hour

	Area under the ROC curve 0.9				*p<0.05*	
UP/C RATIO	SENSITIVITY	95%CI	SPECIFICITY	95% CI	+LR	-LR
>0.1171	100	96.4 - 100.0	98.1	93.4 - 99.7	53.5	0
>0.1481	96	90.2 - 98.9	99.1	94.9 - 99.8	102.76	0.04
>0.1604	95	88.8 - 98.4	100	96.6 - 100	>101.7	0.05

ROC Data for 40 Cases at Proteinuria > 3.5 g/24 hour

	Area under the ROC curve 0.9				p< 0.05	
UP/C RATIO	SENSITIVITY	95%CI	SPECIFICITY	95% CI	+LR	-LR
>2.5624	100	78.0 - 100.0	96.4	92.7 - 98.5	27.57	0
>2.867	93.3	68.0 - 98.9	98.4	95.5 - 99.7	60.04	0.07
>3.2318	80	51.9 - 95.4	100	98.1 - 100.0	>154.4	0.2
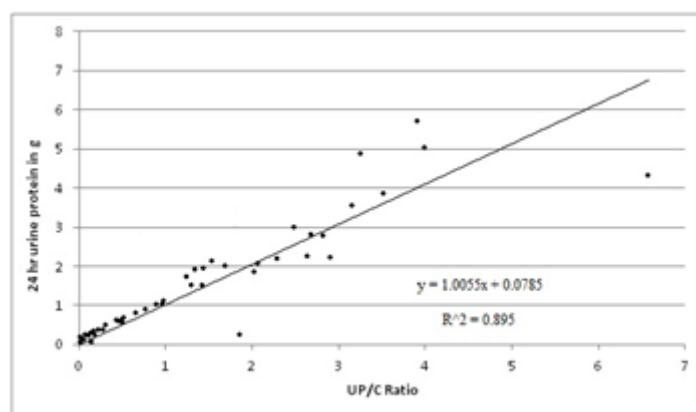
RELATIONSHIP BETWEEN URINE PCR AND 24 HOUR URINE PROTEIN

IV. DISCUSSION

A good correlation between the PCR and urine protein excretion has been demonstrated in patients with diabetic nephropathy and pregnancy. In our institute 24 hour urinary protein estimation is used for diagnosis and follow up in patients suspected of proteinuria. UP/C ratio will be useful in children and pregnant females in whom collection of 24 hour samples is difficult and for repeated follow up of cases having diabetes and hypertension.

The findings of our study showed a very good correlation between 24 hour urine protein and PCR. To use both

tests interchangeably, it is important to demonstrate that both methods agree sufficiently.

Normal urine albumin excretion is less than 22 mg in 24 hours. Micro albuminuria is defined as albumin excretion more than 30 mg/24hr but below 300 mg/24hr. In diseases like diabetes and hypertension diagnosis of micro albuminuria is important to initiate appropriate treatment. If treatment is not given in time progressive renal failure can develop.

The excellent correlation between UP/C ratio and 24 hour urinary protein is corroborated by other studies. Chitalia et alstudying patients with glomerular diseases found correlation between UP/C ratio and 24 hour urine protein was good at $p < 0.05$ and correlation coefficient of 0.97.

UP/C ratio threshold 0.1171 to distinguish normal from abnormal proteinuria is very good for a screening test with sensitivity 100% and 5% false positives. Convincing absence of proteinuria by a good test is important considering the increasing costs involved in treatment of patients with end stage renal diseases, caused by delayed presentation and diagnosis of disease

UP/C ratio cutoff 0.1604 to distinguish normal from abnormal proteinuria having sensitivity 95% and specificity 100 % (no false positives) can be used when the clinical suspicion of the patient having renal disease is low.

UP/C ratio cutoff 2.5624 is a good criterion to screen for nephrotic proteinuria with sensitivity of 100% and specificity of 96.4%. UP/C ratio 3.2318 when considered compared to other cutoffs has specificity of 100% and sensitivity of 80%. It is recommended as the criterion for determining nephrotic range proteinuria when clinical suspicion is low.

V.   CONCLUSION

We conclude that the PCR in spot urine specimens is an accurate, convenient, and reliable method to estimate the protein excretion in urine.

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