



DIABETIC NEPHROPATHY; PROTEIN TO CREATININE RATIO AS A COST EFFECTIVE DIAGNOSTIC TOOL FOR DETECTION

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ABSTRACT... Objectives: To determine diagnostic accuracy of spot urine Protein to creatinine ratio for detection of diabetic nephropathy taking 24-hour urinary protein as gold standard. **Study Design:** cross sectional. **Settings:** Medical and Radiology department of Allied hospital Faisalabad. **Duration:** 12-12-2013 to 12-06-2014. **Sample size:** 134. **Material & Methods:** It was a cross-sectional study done in Medical Unit I, Allied Hospital Faisalabad. 134 patients with suspicion of diabetic nephropathy were included. 24-hour urine sample collected by instructing patients to begin collection immediately after completion of first voiding in morning and to collect all urine into same container having 5mL of 10% thymol in iso-propanol as a preservative for 24-hours. This was thoroughly mixed, 2mL was taken for evaluation of proteins. PC ratio was calculated by dividing Urinary Protein concentration by Urinary Creatinine concentration. **Results:** The mean age of patients was noted as 55.11 ± 6.79 years. There were 62.7% male and 37.3% female patients. Mean PC ratio of the patients was noted as 0.21 ± 0.07 . Sensitivity of PC ratio was noted as 95.2%, whereas specificity was 76.5%, PPV 86.8%, NPV 90.7% with diagnostic accuracy of 88.1%. **Conclusion:** The study results showed that PC ratio is sensitive enough to diagnose diabetic nephropathy instead of 24-hour urinary protein.

Key words: Diabetic Nephropathy, PC Ratio, Albuminuria.

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INTRODUCTION

Diabetic neuropathy (DN), a clinical syndrome, regarded as tenacious albuminuria (>300 mg/d or >200 μ g/min) which is established on at least 2 times, 3-6 months apart, raised arterial blood pressure and reformist decrease in glomerular filtration rate (GFR).^{1,2}

According to latest literature, whole occurrence of DN was considered as 42.5%.³ Generally, DN is considered after a mundane analysis of urine and screening of micro albuminuria in diabetes setting.⁴

It is controversial that GFR calculations, which are creatinine-based, is the most delicate and sensitive method for assessment of early decline in renal function in patients with type 2 diabetes who are having mild to moderate CKD.⁵

A gold standard for quantitative evaluation of proteinuria is 24-hour urinary protein (UP). It

has sensitivity and specificity of 100% and 90% respectively. This method is, however, cumbersome and inconvenient because it is challenging to collect accurately complete 24 hour urine samples particularly in out-patient set up. A substitute method, for quantitative evaluation of proteinuria, is protein-to-creatinine ratio (PCR) measurement which is done on untimed spot urine specimen. It provides a more suitable and convenient method to measure the protein excretion. Even though there is reasonable co-relation between PCR and UP yet the settlement between these two measuring techniques should be evaluated when considering one for replacement of other.⁶

According to a study, spot urine P:C ratio for sensitivity and specificity is 93.55% and 72.73% amongst the patients of type II diabetes who are taking 24-hour urinary protein as gold standard.⁷

The objective of my study is that spot urine P:C ratio is not in local practice. If accurateness of spot

urine is found, results of the study will definitely will be supportive for quick and early detection of diabetic neuropathy as extended time is taken by 24-hour urine protein.

MATERIAL AND METHODS

Cross-sectional study conducted in Medical Unit I, Department of Medicine and Radiology, Allied Hospital, Faisalabad. Mandatory ultrasound was performed by the consultant Radiologist using LOGIC 5 Doppler ultrasound machine for evaluation of renal status. After taking approval from Hospital Ethical Committee, 134 patients who fulfill the inclusion and exclusion criteria were enrolled in the study from OPD of Allied Hospital, Faisalabad. Informed consent of patients was obtained. All basic demographic information of each patient (name, age, sex, address and contact) was noted.

Inclusion criteria

- Age: 45-70years
- Gender: both gender (male and female)
- Suspected case of Diabetic nephropathy:

As mentioned in operational definition

Exclusion criteria

- Pregnant females
- HTN (BP \geq 140/90mmHg)
- poorly controlled DM (BSR>200mg/dl)
- chronic renal failure before diabetes (Serum creatinine>1.2mg/dl)
- Patients with UTI (on laboratory examination)
- Glomerular nephritis due to other systemic conditions as mentioned above.

24-hour urine sample was collected by instructing patients to begin collection immediately after completion of first voiding in morning and to collect all urine into same container having 5mL of 10% thymol in iso-propanol as a preservative for 24 hours, including final void at completion of 24 hour period in the pathology laboratory of the hospital.

The collected data was analysed statistically by using SPSS version 16.

RESULTS

Total 134 cases were enrolled in this study from OPD of Allied Hospital, Faisalabad. The mean age of patients was noted as 55.11 ± 6.79 years with minimum and maximum ages of 45 and 70 years respectively. Table-I.

Age (Years)	n	134
	Mean	55.11
	SD	6.79
	Minimum	45
	Maximum	70

Table-I. Descriptive statistics of age (years) of patients

Out of 134 patients in this study, 84 (62.7%) patients were males whereas 50 (37.3%) patients were females. Figure-1

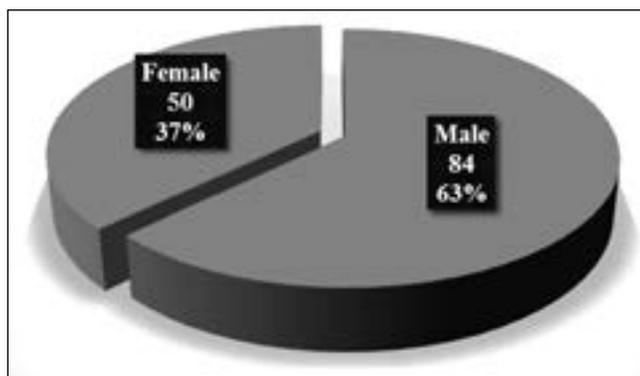


Figure-1. Distribution about Gender of the Patients

The study results showed that the mean PC ratio of the patients was noted as 0.21 ± 0.07 with minimum and maximum ratios of 0.10 & 0.33 respectively. Table-II.

PC Ratio	n	132
	Mean	0.21
	SD	0.07
	Minimum	0.10
	Maximum	0.33

Table-II. Descriptive statistics of PC ratio of the patients

In this study most of 91 (67.9%) patients had positive PC ratio and 43 (32.1%) had negative PC ratio. Table-III.

		Frequency	Percent
PC Ratio	Positive	91	67.9%
	Negative	43	32.1%
	Total	134	100.0%

Table-III. Distribution of PC ratio of patients

The mean protein level of the patients was observed as 345.75±112.49 mg/l with minimum and maximum values of 136mg/l and 500mg/l respectively. Table-IV.

Protein Level	n	132
	Mean	345.75
	SD	112.49
	Minimum	136
	Maximum	500

Table-IV. Descriptive statistics of Protein level

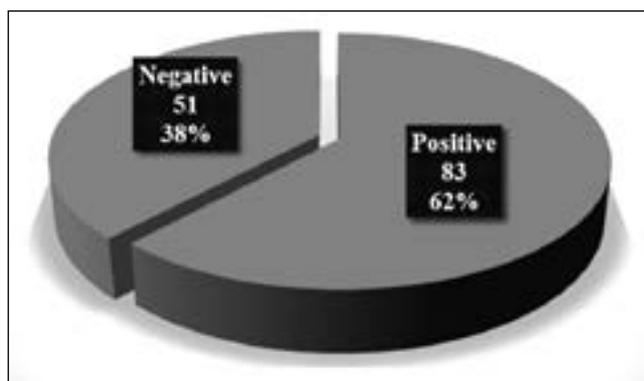


Figure-2. Distribution about protein level of patients

The protein level was positive in 83 (61.9%) patients and was negative in 51 (38.1%) patients. Figure-2

Thus 2x2 table was generated to measure the diagnostic accuracy of P.C ratio taking 24 hours urinary protein as gold standard. The sensitivity of P.C ratio was calculated as 95.2%, whereas the specificity was found as 76.5%. The PPV was calculated as 86.8% and NPV was calculated as 90.7%. The overall diagnostic accuracy of P.C ratio was 88.1%. Table-V.

		Protein Level		Total
		Positive	Negative	
PC Ratio	Positive	79	12	91
	Negative	4	39	43
Total		83	51	134

Table-V. Comparison of PC ratio with 24 hours urinary Protein

Sensitivity	95.2%
Specificity	76.5%
Positive Predictive Value	86.8%
Negative Predictive Value	90.7%
Diagnostic Accuracy	88.1%

DISCUSSION

Proteinuria quantification is significant for observing disease advancement and response to therapies in patients with numerous types of nephritis like diabetic nephropathy, owing to hypertension and unknown etiology. According to the guidelines for the management of kidney disease, one of the remission criteria for kidney disease diagnosis is 24-hour urine total protein <0.5 g/day.

Threshold or clinically significant value of Proteinuria of >1 g/day is considered for renal biopsy. Further, proteinuria, in nephrotic range is severe i.e. >3.5 g/day.⁸ A worldwide elevation in urinary protein excretion in diagnosis, detection and people management who are considered to be at high risk of developing renal diseases regular check-up in such individuals.⁹

Since renal involvement is reversible at initial stage that's why it is important to detect renal contribution. Further, the disease progressin can be checked. Early detection diminishes both the treatment cost and also mortality.¹⁰

The current study showed that patients mean age was 55.17%males although most patients were males. Males were 62.7% and women were 55.112.7% as reinforced bt Yadav et al. study. Rendering the results of Yadav study, amongst 144 subjects, 103 were maes and females were 25.¹¹

Jayasekara JMKB et al study also showed more male patients. in their study 28 were males and 20 were females.(8) Monika Pathania et al., enrolled 179 patients with DM participated in the study. Out of 179 participant's, 103 (57.54%) were male and 76 (42.46%) were female. Participants' age ranged from 23 to 88 years, with an average of 56.42 ± 12.2 years.¹⁰

Sensitivity of P.C ratio taking protein level as gold standard was renowned as 95.2% but specificity was found 76.5%, PPV values were 86.8%,of NPV was 90.7% having accuracy of 88.1%.Our study was reinforced by other authors like Jung-Hwa

Park., et al decided that Random urine P:c ratio is consistent marker of significant proteinuria in preeclampsia and possibly be better at providing earlier diagnostic information as compared to 24-hour urine protein excretion and having more correctness as compared to urinary dipstick test(12).Some researchers projected that more accurate and rapid diagnostic test having the ability of predicting 24-hour urine protein excretion would be highly important, by using random urine P.C ratio to simplify prompt decision making by clinicians.^{13,14}

Usefulness of random urine P.C ratio have been established already by numerous scientists , as well as some that have accessible indication of good association with adequate sensitivity in forecasting significant proteinuria founded on urine collected at different time periods.¹⁵⁻¹⁷ Yadav BK et al showed a positive association between the random urine P.C ratio and 24-hour urinary protein in type 2 diabetes mellitus patients.

Ruggenti P et al showed that P.C ratio forecast the rate of failure even more accurately than 24-hour urinary protein excretion, which proposes that the random urine P.C ratio is more precise catalog of kidney traffic of plasma proteins compared to 24-hour urinary total proteins.¹⁸ Seyed-Ali and Navin Jaipaul found that the random urine P.C ratio is a consistent and practical way of assessing and following proteinuria, but its precision and accuracy may be affected by the level of patient physical activity.¹⁹

Jiunn-Min Wang et al concluded that P:C ratio or albumin to Creatinine ratio, which was acquired by dipstick, can be used to screen the potential danger of renal diseases in hypertensive, out-patient and diabetic patients. At the ideal cutoff point of 0.15, the investigative presentation was high with sensitivity and specificity of 96.65 and 74.4% respectively.²⁰ The higher value found for sensitivity compared with specificity would propose that the ratio test might be more cherished as a rule out test suggested by BK Yadav et al.⁵⁵ Nahid Shahbazian and Farzaneh Hosseini-Asl concluded that a random urine P.C ratio forecasts

the amount of 24-hour urine protein excretion with a highly accuracy.²¹

Tornng. Setal., in their study of urine protein to creatinine ratio as a prognosticator of 24-h urine protein excretion in renal transplant patients stated that urine P/C ratio is a useful and suitable with high sensitivity (74.4-90%) and specificity values (93-98%) for approximating proteinuria from 0.5 to 2 g/day.²² Few authors have made reference to the use of the protein, creatinine ratio for the purposes of presiding out proteinuria; however, Dyson et al. illustrated attention to this usage and to the fact that it can decrease the need on a test procedure (i.e., 24-hour urinary protein) that is both unreliable and costly.²³

CONCLUSION

The study results showed that PC ratio was sensitive enough to diagnose diabetic nephropathy instead of 24-hour urinary protein which time and cost consuming. Now in future we can recommend and rely upon the use of spot urine PC ratio for diagnosis of diabetic nephropathy instead of waiting for 24-hours urinary protein.

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