ORIGINAL RESEARCH PAPER

General Medicine

A STUDY OF CORRELATION OF SPOT URINE PROTEIN-CREATININE RATIO WITH 24HOUR URINARY PROTEIN IN TYPE 2 DIABETES MELLITUS PATIENTS AT A TERTIARY CARE HOSPITAL

KEY WORDS: Diabetes mellitus type2, 24 hours urinary protein, urine Protein-Creatinine Ratio.

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ABSTRACT

Background: Diabetic nephropathy is the major cause for chronic renal failure (CRF) and proteinuria is an independent risk factor for end stage renal disease. Hence, early identification and quantification of proteinuria is of prime importance in the diagnosis and management.

Method: The present study is a prospective observational study conducted amongst 50 diabetic subjects in Medicine department & IKDRC, Civil Hospital Ahmedabad. The study carried out during the period between July 2017 to October 2019. All patients were treated as per standard treatment protocol. 24-hour urine protein and random urine protein to creatinine ratio (P:C) was determined.

Result: Total 50(24 male &26 female) patients were studied. A strong correlation was found between 24 hours urine protein and protein- Creatinine ratio, especially in patient with eGFR >30 (CKD stage I to III) with coefficient of correlation of 0.973. However correlation weaken as the GFR worsens and is weakest in patients with stage 5 CKD

Conclusion: The random urine Protein:Creatinine ratio predicts the amount of 24-hour urinary protein excretion with high accuracy. Hence it can be used as a faster substitute test for 24-hour urinary protein estimation.

INTRODUCTION

Diabetic nephropathy is the major cause for chronic renal failure (CRF) and proteinuria is an independent risk factor for end stage renal disease. Hence, early identification and quantification of proteinuria is of prime importance in the diagnosis and management.

Urine analysis is an important tool in clinical medicine. Proteinuria is a condition in which urine contains an excess amount of proteins. Proteinuria is sometimes the only evidence of severe kidney disease. Detection of proteinuria uncovers renal diseases and also frequently points to a specific diagnosis. Testing the urine for proteinuria has been part of the routine clinical examination. A positive urine protein dipstick test usually initiates the evaluation for proteinuria.

Protein excretion in urine varies with stress, exercise, hydration status, posture and also diurnally. Hence, the gold standard test is quantitative estimation of protein done on urine collected over 24 hours.

However it has few limitations. Urine protein estimation by 24 hour collection is a cumbersome task with many errors including incomplete collections, bacterial growth, incorrect timings and incomplete bladder emptying. These errors far exceed those caused by diurnal variation in protein excretion. Urine PCR (Protein creatinine ratio) has been found to be a good predictor of protein estimation over 24 hour urine collection in various studies.

METHOD

The present study is a prospective observational study carried out in Medicine department &IKDRC, Civil Hospital Ahmedabad. The study carried out during the period between July 2017 to October 2019. All the patients are included according to inclusion and exclusion criteria. All patients were treated as per standard treatment protocol.

Subject selection:-

INCLUSION CRITERIA:

Patients of type 2 Diabetes Mellitus from age group > 18 years coming to Medicine department & IKDRC Civil Hospital Ahmedabad, either OPD and indoor, with their consent, were included.

EXCLUSION CRITERIA:

Non diabetic patients, type 1 diabetic patients, patients on haemodialysis, pregnant patients, patients with urinary tract infections, age < 18 years were excluded.

Study procedure:

The patients were selected according to inclusion and exclusion criteria. All patients attending the General Medicine and Nephrology Outpatient / Inpatient Department were asked to collect 24hours urine. Instructions were given to the patient. Then they were asked to void the first morning sample and then collect urine from that day onwards till the next day including the morning first void sample Urine was collected in a 5 litre sterile plastic can with a 25ml of aceticaidor , 5-10ml of conc. Hydrochloric acid ,added as

preservative. The collected sample was analysed for 24urine protein. Estimation by auto analyser. Blood samples were also collected and sent for analysis. Patients were also requested to collect their first void sample the next morning and this sampsle was analysed for urine PCR.

RESULTS

A study of 50 patients was undertaken which showed a strong relation between 24 hours urinary protein and spot Protein Creatinine Ratio with coefficient of correlation of 0.973.

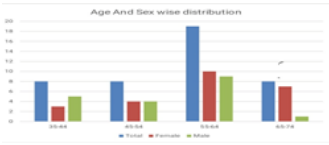

Figure 1. Age and Gender wise Distribution

Majority of the patients were in the age range of 54-60yrs (38%). 21 (42%) were males and 29 (58%) were females. M:F ratio was 0.72:1.

Table 1:Paired Samples Statistics (24 hours urine protein and Urine PCR)

	Mean	Number	Standard Deviation	Standard Error Mean	Significance 'p' value
24 Hours Urine Protein	**4.9**	50	3.29	0.465	<0.05

In this study, a quantitative estimation of proteinuria was done from samples using Protein Creatinine Ratio values and analysed which correlated best with 24 hours urinary protein value with coefficient of correlation of 0.91.

Table 2. Paired Samples Correlations (24 hours urine protein and Urine PCR)

	Number	Co-efficient of correlation (r)
24 Hours Urine Protein and urine PCR	50	0.91

Table 3.Comparison of coefficient of correlation (urine PCR and 24 hours urine protein)

Group (CKD Stage)	No. of Patients (%)	Correlation (r value)
1-3	33(66)	0.973
4-5	17(34)	0.915
5	5(10)	0.914

A strong correlation was found between 24hours urine protein and protein-Creatinine ratio, especially in patient with eGFR>30 (CKD stage I to III) with coefficient of correlation of 0.973. So it can be useful for knowing diabetic related microvascular complication and for preventing further macrovascular symptoms. However correlation weaken as the GFR worsens and is weakest in patients with stage 5 CKD.

An excellent correlation was found between 24hours urine protein and protein-Creatinine ratio, with best correlation in patients with normal or mildly impaired renal dysfunction with non nephritic proteinuria.

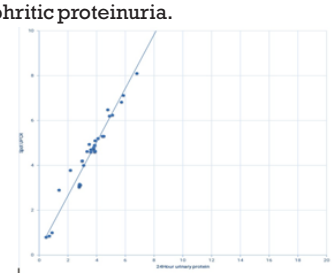

Figure 2. Scatter Plot Urinary PCR Versus 24 Urinary Protein.

DISCUSSION

Diabetic nephropathy accounts for about 20% of cases of chronic renal failure and is the single most common cause of ESRD in many countries. It is generally said that diabetic nephropathy is viewed as a descending path from normal albumin ratio ESRD which is marked by intermediate test age microalbuminuria and over proteinuria. Measurement of urinary proteins over 24 hours is the definitive method to quantify proteinuria. However, prolonged collections of urine are inconvenient and often inaccurate due to frequent collection errors. In this study, A quantitative estimation of proteinuria was done from samples using Protein Creatinine Ratio values and analysed which correlated best with 24 hours urinary protein value with coefficient of correlation of 0.91. The present study was compared with others study and the following results were found – Biradel et al study include 42 patients have r-value 0.92 with p-value <0.0001 where Naufal rizwan TA include 55 patients with r-value 0.87 with p-value 0.01.

This study was conducted to evaluate the correlation between 24-hr urine protein and random urinary P:C ratio and to find the appropriate P:C cut off for the prediction of significant proteinuria in diabetic subjects. Although some investigators advocate the use of albumin an alternative to the total protein measurement and others have suggested that the profile of protein excreted has differential diagnostic and prognostic Value, the National kidney foundation has recommended that an increase in protein excretion be used as a screening tools in patients at risk of developing renal disease. Since a rapid and accurate test avoid the inconvenience to the patients as well as delay in diagnosis, a spot P:C ratio was taken as a rapid tool linear study to correlate it with 24-hr protein.

CONCLUSION

For years, 24 hours urine collections are often used to quantify proteinuria. Though it is gold standard, but it is cumbersome, subjective to collection errors, required good compliance, and result in a delay of more than 24 hours in diagnosis. Protein Creatinine ratio in the random urine sample is found to be, simple yet rapid and an useful index for quantification of proteinuria in patients with varying degree of proteinuria and renal dysfunction, and gives an early diagnosis.

An excellent correlation was found between 24 hours urine protein and protein- Creatinine ratio, with best correlation in patients with normal or mildly impaired renal dysfunction with non nephrotic proteinuria.

It avoids collection errors, less time consuming and is suitable for outpatient departments and also for follow up testing.

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