

Original Research article

Urine Protein Creatinine Ratio a better routine test for Proteinuria

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Abstract

Proteinuria is a common incidental finding seen in urine routine examination sent to laboratories . Proteinuria is often transient and benign, or it can be persistent proteinuria, the cause of proteinuria should be found as it has great implications. Persistent proteinuria can be a manifestation of a systemic disease involving kidney or any other organ. It can represent the early stages of chronic kidney disease, which can progress to kidney failure hence timely intervention can prolong progression of chronic kidney diseases. Proteinuria also causes increased atherosclerosis and left ventricular abnormalities leading to cardiovascular morbidity and mortality. In conclusion , Urine Protein Creatinine ratio is an effective and accurate test for screening, diagnosis and monitoring of proteinuria in systemic disorders. Urine Protein Creatinine ratio should replace dipstick testing for proteinuria diagnosis as a routine test.

Introduction

Proteinuria is a common incidental finding seen in urine routine examination sent to laboratories . Proteinuria is often transient and benign, or it can be persistent proteinuria, the cause of proteinuria should be found as it has great implications. Persistent proteinuria can be a manifestation of a systemic disease involving kidney or any other organ. It can represent the early stages of chronic kidney disease, which can progress to kidney failure hence timely intervention can prolong progression of chronic kidney diseases . Proteinuria also causes increased atherosclerosis and left ventricular abnormalities leading to cardiovascular morbidity and mortality.[1-3]

Hence the cause of proteinuria should always be sought.

The methods to quantify proteinuria vary, but till today 24-hour urine protein measurement is considered as gold standard for protein estimation[4], however it is difficult and time consuming and its usefulness is limited to collection errors, storage difficulties, specimen handling, and poor patient compliance.[5-6]

Considering these issues, alternative methods for diagnosis of proteinuria have been thought off, which mainly include dipstick method and spot urinary protein : creatinine ratio

The dipstick is inexpensive, easy to use, and rapid, but their usefulness is limited due to their low sensitivity and specificity[7-8]. More so ever, the inherent inaccuracies in dipstick analysis are thought to be influenced by urinary concentration, presence of infection, pH, antibiotics like penicillin and sulphonamides and haematuria.

It is essentially specific for albumin and may miss detection by other low molecular protein

Dipstick methods correlate poorly with quantitative urine protein estimations.[9]

Urine protein creatinine ratio (UPCR) is basically a ratio of urinary protein and urinary creatinine on random urine samples. It correlates with 24hrs urinary protein estimation and some studies also indicate that it is more accurate than 24 hrs urinary protein estimations

There are numerous studies which state that the UPCR is a more sensitive and specific test than dipstick test for Proteinuria [10-17] Various diagnostic protocols screen for proteinuria by dipstick method and then confirm by UPCR, however there are many dipstick negative samples which show proteinuria by UPCR and this study is done to evaluate such urine samples.

Aims and Objectives

To detect proteinuria by UPCR in urine samples negative for protein by dipstick method

Materials and Methods

The study was carried out in Dr. D. Y. Patil Medical College, Pune

Sample size - 182 urine samples was analysed

Method

Urine samples for routine microscopy was initially analysed for proteinuria by dipstick method.

Urine samples negative for proteinuria by dipstick method was taken for quantification by UPCR

Urinary protein was estimated by turbidometric method

Urinary creatinine was estimated by Jaffe's kinetic method

UPCR was calculated as in (mg/dl) : Urinary Protein / Urinary Creatinine

The diagnosis of Proteinuria by UPCR is as follows

UPCR \leq 0.2 : Normal

UPCR $>$ 0.2 and $<$ 3.5 : Proteinuria

UPCR $>$ 3.5 : Nephrotic range Proteinuria

Inclusion Criteria

Urine samples negative for Proteinuria by dipstick method

Exclusion Criteria

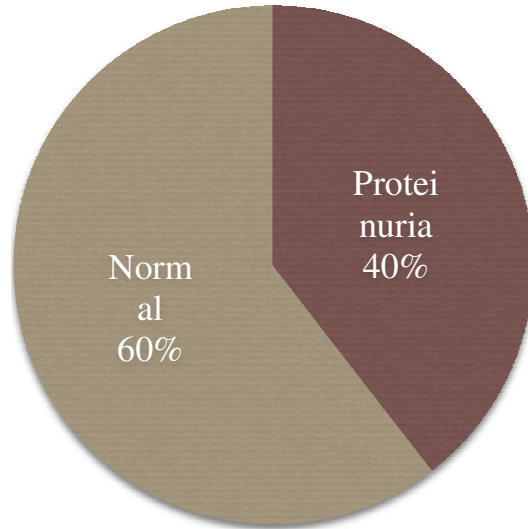
Turbid samples

Samples containing RBC, Hb

Children less than 5 years

Results

Total Normal dipstick urine samples analysed -182



182 dipstick protein negative samples were analysed for Proteinuria by UPCR

UPCR ≤ 0.2 was seen in 110 samples (Normal)

UPCR > 0.2 was seen in 72 samples (Proteinuria)

UPCR > 0.2 and < 1.0 : 50 samples

UPCR > 1.0 and < 2.0 : 22 samples

Discussion

Proteinuria is a common finding in clinical practice and is defined as urinary protein excretion of more than 150 mg per day.[18] Urine Protein Creatinine ratio is an important test for diagnosis of proteinuria. It enables the clinicians to quantify proteinuria fairly accurate and avoid time taking and cumbersome 24 hrs urinary protein estimation. Routine use of UPCR has led to better understanding and association of proteinuria with various renal and non renal disorders. As a result of the above advantages various guidelines are issued by different clinical associations making UPCR as an integral part of diagnosis of proteinuria. The American College of Obstetrics and Gynaecology recommends diagnosis of Proteinuria if UPCR is > 0.3 , which corresponds to protein excretion of > 300 mg / day. This emphasise the role of UPCR in diagnosis of Pre eclampsia and Hypertensive disorders in pregnancy.[19]

The National Kidney Foundation (USA), the Australasian Society for the Study of Hypertension in Pregnancy and the International Society for the Study of Hypertension in Pregnancy have recommended use of the urinary spot UP/C ratio as an alternative to 24 hour urine collection for urine protein estimation.[20,21,22]

Caring for Australians with Renal Impairment (CARI) Guidelines, 2004 and Amir Said Alizadeh Naderi, MD and Robert F. Reilly, MD, 2008 [23] - issued guidelines for quantitative proteinuria by Protein: Creatinine ratio measurements on a single-voided specimen provide a convenient and reliable alternative method than 24-hours urine

measurements, thus enabling early diagnosis of renal involvement in patients of diabetes and hypertension in whom presence microalbuminuria signifies renal involvement.

The UK National Institute for Health and Care Excellence (NICE)[24], the UK Renal Association[25] and the Scottish Intercollegiate Guidelines Network (SIGN)[26] guidelines oppose the use of dipstick methodology in isolation, since reagent strip test results are dependent on urine concentration and are unreliable for the detection of low levels of proteinuria or quantification of the proteinuria, with low positive and negative predictive values. This emphasises the significance of Proteinuria estimation by UPCR as a screening and diagnosis of proteinuria by alternative methods; mainly UPCR.

KDIGO Guidelines recommend the evaluation of urine protein to creatinine ratio as surrogate for 24-hour total proteinuria. The Kidney Disease Outcomes Quality Initiative (K/DOQI) of the National Kidney Foundation Practice Guideline recommended the use of “spot” urine protein/ creatinine measurements to detect proteinuria when staging CKD; it recommended that under most circumstances, untimed (“spot”) urine sample should be used to detect and monitor proteinuria in children and adults and it is usually not necessary to obtain a timed urine collection (overnight or 24-hour) for these evaluations in either children or adults.[27,28,29]

American Diabetes Association (ADA) also strongly encouraged a spot urine sample for the quantitative albuminuria or proteinuria, whereas 24h collection or a timed specimen are rarely necessary while screening for microalbuminuria or proteinuria in diabetic patients [30,31,32]

Conclusion

Urine Protein Creatinine ratio is an effective and accurate test for screening, diagnosis and monitoring of proteinuria in systemic disorders.

Urine Protein Creatinine ratio should replace dipstick testing for proteinuria diagnosis as a routine test.

Informed Consent

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institution and / or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent was obtained from all participants included in the study.

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