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Original Research Article

STUDY OF SPOT URINARY PROTEIN CREATININE RATIO AS AN INDEX OF QUANTITATIVE PROTEINURIA

Dr. Monika Jayaswal[1], Dr. Vijay Kumar [2], Dr. (Prof.) Sude Kr. Singh [3]

1- TUTOR, Dept. of Biochemistry, Darbhanga Medical College& Hospital, Laheriasarai, Darbhanga, Bihar.

2- Assistant Professor, Department of Medicine, Patna Medical College & Hospital, Patna, Bihar

3- Professor & Head, Dept. of Biochemistry, Darbhanga Medical College & Hospital , Laheriasarai, Darbhanga, Bihar.

Corresponding author: Dr. Monika Jayaswal,

Tutor, Department of Biochemistry

Darbhanga Medical College, Laheriasarai, Darbhanga, Bihar

ABSTRACT

Introduction

Proteinuria is a condition in which urine contains an excess amount of proteins . Examination of urine is one of the most rewarding tests in clinical biochemistry ,as not only does it uncovers renal diseases but also frequently points to a specific diagnosis . Normal daily protein excretion in an adult does not exceed 150 mg . Persistent proteinuria or microalbuminuria in any adult suggests not only the existence of renal disease but also an increased risk of MI and stroke .

Aims and objectives

To compare spot urine protein creatinine ratio with 24 hours urine protein as an index of quantitative proteinuria .

Conclusions

1) Protein creatinine in the first morning urine sample is found to be a useful index for quantification of proteinuria in pts with varying degree of proteinuria and renal dysfunction
2) There was a goood positive correlation between spot urine protein creatinine ratio and 24 hours estimated protein .
3) The correlation was best in pts with normal or mildly impaired renal function with no nephrotic range proteinuria .
4) The positive correlation was least in patients with moderate to severe renal dysfunction .
5) Urine protein creatinine ratio is easy to perform , inexpensive and less time consuming . it can be used in outpatient setting for screening and quantification of proteinuria .

Keywords: Microalbuminuria, urine albumin measurement, albumin:creatinine ratio,

Introduction

Proteinuria is a condition in which urine contains an excess amount of proteins . examination of urine is one of the most rewarding tests in clinical biochemistry ,as not only does it uncovers renal diseases but also frequently points to a specific diagnosis . Normal daily protein excretion in an adult does not

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exceed 150 mgs . Persistent proteinuria or microalbuminuria in any adult suggests not only the existence of renal disease but also an increased risk of MI and stroke .
Persistent proteinuria of >1gm/day , usually indicates renal disease . proteinuria may be minimal(,1gm/day) , moderate(1-3 gm/day) and heavy (>3gm/day) . current methods for measuring proteinuria vary significantly . commonly used methods are dipstick urine analysis , 24 hrs urine protein estimation and spot urine protein creatinine ratio . very few indian studies have compared the efficacy of 24 hrs urinary protein with spot urine protein creatinine ratio , which this study attempts to do .

Aims and objectives

To compare spot urine protein creatinine ratio with 24 hours urine protein as an index of quantitative proteinuria .

Pathophysiological classification of proteinuria

Benign	Pathological
Postural	Glomerular
Functional	tubular
Transient	overflow
Intermittent	secretory

Pathological proteinuria – this is persistent proteinuria that is detected on multiple ambulatory clinical visits . this is seen in both recumbent and upright positions
1)glomerular proteinuria – ranges from few hundred mgs to 100 gm per 24 hours. Excretion of more than 2 gm per 24 hours is usually a result of glomerular disease . It is of 2 types - selective &non selective
2) Tubular proteinuria – causes are

Hypertensive nephrosclerosis
Tubulointerstitial diseases d/t- Fanconi syndrome , heavy metals , uric acid nephropathy , acute hypersensitivity , interstitial nephritis , sickle cell disease , drugs(NSAIDs , Antibiotics)

3) Overflow proteinuria- causes are ---multiple myeloma , myoglobinuria , rhabdomyolysis , lymphoproliferative disorders

Microalbuminuria – is defined as daily albumin excretion of 30-300 mg/mg creatinine in a spot collection . diseases such as diabetes and hypertension can manifest as microalbuminuria . it is thought to be the earliest sign of nephropathy in diabetes mellitus .
Whom to screen ?
1) Type 1 annually from 5 yrs after diagnosis
2) Type 2 annually from the time of diagnosis

Semiquantitative analysis by dipstick

Grade	**Protein level**
Negative	**<10mg/dl**
Trace	**10-20 mg/dl**
1+	**30mg/dl**
2+	**100 mg/dl**
3+	**300 mg/dl**
4+	**>2000mg/dl**

Urinary creatinine estimation was done by Folin's method on the photoelectric colorimeter. Reagents used are :-
1.Creatinine Standard Solution .
2. Saturated Solution Of Picric Acid.
3. 10%(W/V) Sodium Hydroxide Solution.
Three Test tubes marked as unknown (U) , standard(S),& Blank (B) were taken. Their optical densities were measured on a photoelectric colorimeter and creatinine in 100 ml urine was calculated as
U-B/S-B x creatinine standard (100 mg)
Albumin (mg/dl) **ACR** (mg/g) = ---------- x 1000. Creatinine (mg/dl) **ACR** (mg/g) can be calculated by albumin (mg/dl) divided by creatinine (g/dl).
Interconversion of units:
ACR (1 mg/g = 1 μg/mg = 0.113 mg/mmol). Dividing the ACR by 8.84
converts the units (from μg/mg or mg/g to mg/mmol. There is conversion factor for creatinine in various units . Another easy way of conversion of creatinine is to convert mg/dl to g/L.

Urinary protein creatinine ratio-
The ratio is about the same numerical as the number of grams of protein excreted in urine per day . thus a ratio less than 0.2 is equivalent to 0.2 gms of protein/day and is considered normal and a ratio of 3.5 is equivalent to 3.5 gm of protein/day .

Interpretation of findings of microscopic examination of urine

Fatty casts , free fat or oval fat bodies	**Nephritic proteinuria**
Leukocytes , leukocyte cats with bacteria	**UTI**
Leucocytes , leucocyte casts without bacteria	**Renal interstitial disease**
Normal shaped erythrocytes	**s/o lower UT lesions**
Dysmorphic erythrocytes	**s/o upper UT lesions**
Erythrocyte casts	**Glomerular disease**
Eosinophiluria	**Drug induced acute interstitial nephritis**
Waxy granular casts	**Adv CRF**
Hyaline casts	**Dehydration , diuretics**

Methodology :-
The study was done from Patients reporting to Dept. of Biochemistry, Darbhanga Medical College , Laheriasarai, Darbhanga, Bihar for Biochemical Analysis during the period of March 2017 to October 2018.

Inclusion criteria
1) Patient of either sex
2) Patient above 16 years
3) Patient with persistent dipstick positive proteinuria

Exclusion criteria
1) Patients of age less than 16 years
2) Gross hematuria
3) Patients with a febrile illness
4) Dehydration
5) Head injury and cardiac failure

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Observations

In this study the age ranged from 16-60 years , the incidence of proteinuria was maximum in the age group 31-60 years since the incidence of diabetes and hypertension increases with age , and as a consequence of micro vascular disease due to these systemic disorders persistent proteinuria is common as the age advances .

In this study , renal biopsy was performed as and when indicated .

Renal morphology	No of patients
Chronic GMN	10
Acute interstitial nephritis	6
MPGN	6
Membranous GMN	4
Diabetic nephropathy	4
Chronic interstitial nephritis	4
Crescentic GMN	2
Diffuse proliferative GMN	2
FSGS	2
IgA nephropathy	2

Classification of patients on basis of proteinuria

Proteinuria	No of pateints	percentage
Nephrotic	40	40
Non nephrotic	60	60

Calculated Crcl in patients with proteinuria

Calculated Crcl	No of pts	percentage
>50 ml/min	28	28
<50 ml/min	72	72

In this study 32 pateints had moderate to severe renal dysfunction with nephritic range proteinuria . There were 40 patients with moderate to severe renal dysfunction and non nephritic range proteinuria . 20 patients had normal to mild renal dysfunction with non-nephritic range proteinuria and 8 pts had a normal to mild renal dysfunction with nephritic range proteinuria .

There was a good correlation between spot urine protein creatinine and 24 hrs urinary protein . the correlation was best in patients with creatinine clearance >50 and non nephrotic range proteinuria . the correlation was least in patients with crcl<50 and non -nephrotic range proteinuria .

Summary & Conclusions

(1)Protein creatinine in the first morning urine sample is found to be a useful index for quantification of proteinuria in patients with varying degree of proteinuria and renal dysfunction.

(2) There was a positive correlation between spot urine protein creatinine ratio and 24 hours estimated protein .

(3)The correlation was best in patients with normal or mildly impaired renal function with no Nephrotic range proteinuria .

(4)The positive correlation was least in patients with moderate to severe renal dysfunction .

(5)Urine protein creatinine ratio is easy to perform , inexpensive and less time consuming . it can be used in outpatient setting for screening and quantification of proteinuria .

(6)In this study 100 pts with a varying degree of proteinuria and creatinine clearance were investigated . An excellent correlation was found between 24 hours urine protein and protein creatinine ratio . This study supports the use of single voided protein creatinine ratio to predict 24

hours urinary protein . it avoids collection errors , less time consuming and is suitable for OPD PATIENTS .

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